

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION

ORDER No. 93-109

REVISE & RESCIND ORDER No. 89-175

WASTE DISCHARGE REQUIREMENTS FOR:

CHEVRON U.S.A., INC., RICHMOND REFINERY

RICHMOND, CONTRA COSTA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region, hereinafter called the Board, finds that:

Description of Discharger

1. Chevron U.S.A. - Richmond Refinery, a subsidiary of Chevron U.S.A. Inc., (hereinafter called the discharger), owns and operates the Richmond Refinery. The refinery, built at the turn of the century, produces a broad range of fuels, lubricants, asphalt and petrochemicals. The refinery is classified as an integrated refinery as defined by the U.S. Environmental Protection Agency in 40 CFR 419.50. The 2,900 acre refinery is located along the southern shore of San Pablo Bay in Contra Costa County. The City of Richmond lies to the east of the facility. To the east and within one mile from the facility is industrial, residential, commercial and agricultural land use. Wastes generated from the refinery's processes have been deposited at various locations around the refinery.

Existing Orders

2. The Board, on November 15, 1989, issued Waste Discharge Requirements Order No. 89-175. This Order updates and supersedes that Order. The updated requirements reflect new information gained from site investigations at the facility and recent changes in the laws regulating petroleum refineries. This Order establishes new dates and procedures for continued monitoring and investigations.
3. Other Orders issued for the Refinery are:  
93-016 Site Cleanup Requirements for the S.P. Hill Tankfield;  
92-111 NPDES permit for the refinery's discharge of treated waste water;  
92-092 Site Cleanup Requirements for the Alkane Sector;  
92-010 Waste Discharge Requirements for Landfill 15;  
91-098 Cease and Desist Order for Pollard Pond and the Hydropits; and  
90-146 Site Cleanup Requirements for Plant 1/Additives Plant.

Geology

4. The Richmond Refinery and its appurtenant tankfields are located on the peninsula of the Potrero-San Pablo Ridge, which is composed of steeply dipping Franciscan Complex. The refining of the petroleum products generally occurs on the bay fill areas northeast of the ridge. The southwest side of the ridge consists of steep topography wherein the Franciscan Complex has been terraced for the placement of above ground petroleum storage tanks. The tankfields on the southwest side of the ridge are the Point Orient Tankfield, S.P. Hill Tankfield, Quarry Tankfield, and the Office Hill Tankfield.
5. The bay fill areas lie within a localized northwest trending graben, or trough, along the eastern margin of San Francisco Bay. The bedrock of the graben was down-dropped along the now

inactive San Pablo fault, the inferred trace of which parallels the northeastern face of the Potrero-San Pablo Ridge, and along the active Hayward fault zone, which forms the western scarp of the Berkeley Hills, approximately five miles northeast of the Refinery.

6. The flat lying areas consists of transgressive and regressive sedimentary sequences of marine and alluvial sediments. Past fluctuations in sea level created a complex sedimentary sequence of interfingering estuarine and alluvial fan deposits overlying the Franciscan Complex bedrock. The uppermost deposits are artificially placed bay fill, ranging from 3 feet to as much as 30 feet in depth. The fill materials overlies "Bay Muds" which consists of silt and silty clay with abundant plant matter or peat. The Bay Muds onlap onto the Franciscan bedrock and thicken bayward.
7. The San Pablo-Potrero Ridge topography is steep to moderately steep terrain. The bedrock consists of homoclinal sandstones, siltstones and shales of the Franciscan Formation, which commonly outcrop at the site. The outcrops generally dip 40 to 70 degrees towards the southwest, with a strike roughly parallel with the ridge.

#### Hydrogeologic Setting

8. Three hydrogeologic zones have been identified within the top 150 feet of sediments in the flat lying areas of the site; the A-Zone, C-Zone and the B-Zone, in order of increasing depth. The A-Zone is the first water bearing zone and consists of artificial fill and the naturally occurring peat rich, bay mud. The water table elevation for this zone is within two to ten feet of the ground surface and generally discharges to the Bay.
9. The C-Zone is an 80 to 90-foot-thick water bearing zone of interfingering alluvial and estuarine sediments. These sediments generally have low hydraulic conductivity, but sandy, more permeable units occur as channels and lenses. The sand units have not been shown to be contiguous across the site, but do appear to be hydraulically connected. However, based on six years of chemical data there is no indication that the C-Zone groundwater has been significantly impacted. The discharger has concluded that the Bay Mud has been an effective hydraulic barrier between the A and C Zones and is an adequate containment floor to the Groundwater Protection System (GPS). These results and conclusions were presented to the RWQCB in two reports titled, C-Zone Investigation - Phase 1 and Phase 2, dated February 8, 1991 and December 20, 1991 respectively.
10. The B-Zone, is a relatively permeable unit at approximately 100 feet below the ground surface. It ranges from 5 to 15 feet thick and contains potable water, but has limited production capacity. The B-Zone occurs under artesian conditions and appears to be hydraulically separate from the overlying zones.
11. As shown in Figure-3, the Refinery lies in four geomorphic/geologic settings referred to locally as the "Flats," "Ridge," "Alluvial" and "Transition" Zones.
  - a. The **Alluvial Zone** is defined as the broad area of alluvial fan deposits, derived from the Berkeley Hills, east of the Refinery. This zone represents flatland areas in which Bay Mud was not deposited. The upper portion of the alluvial fan deposit is typically clayey with low permeability.
  - b. The **Flats Zone** comprises the flatland marsh area bounded by San Pablo Bay to the north and extending south along the northeast side of Potrero-San Pablo Ridge. For the purpose of the Refinery's investigations, the inland Flats Zone/Alluvial Zone boundary has been defined to be the 5-foot Bay Mud isopach (line of equal thickness). Thus, the Flats Zone is

typically underlain by at least five feet of Bay Mud except where removed by excavation or erosion, in local areas of non-deposition, or where displaced by differential settlement of overlying fill.

- c. The Ridge Zone consists primarily of colluvium (slope wash) overlying deformed Franciscan Complex rocks exposed along Potrero-San Pablo Ridge. The boundary of the Ridge Zone is defined as those areas of Potrero-San Pablo Ridge above the 50-foot elevation contour.
- d. The Transition Zone is defined as the area that separates the Flats Zone from the Ridge Zones. As described above, the Flats-Transition boundary is defined as the 5-foot Bay Mud isopach and the Ridge-Transition boundary is defined as the 50-foot elevation contour.

#### Corrective Action

- 12. The discharger has chosen to initiate a corrective action program described in the report "Groundwater Protection System (GPS) Engineering Report" dated December 20, 1991 for the interception of contaminated groundwater from the facility to San Pablo Bay. The GPS is intended to be a hydraulic control measure composed of a varying combination of slurry wall, extraction trench and/or extraction wells. Groundwater extraction through the trenches and/or wells establishes and maintains a contiguous capture zone which prevents migration of potentially contaminated A-Zone groundwater past the GPS alignment. The slurry wall was installed where thick and/or highly permeable intervals of A-Zone fill soils are encountered. A low permeability Bay Mud "floor" inhibits transport of A-Zone contaminants to the underlying C-Zone in the "Flats Zone" of the Refinery, (see Figure 3).
- 13. The Board has determined that the GPS proposal is a satisfactory corrective action measure for the containment and removal of contaminated groundwater along the perimeter of the facility adjacent to San Pablo Bay. In addition, the discharger has been directed under separate Site Clean-up Orders to remediate any "Hot Spot" contamination within the facility thereby maximizing the efficiency of the GPS as a corrective action.
- 14. The Monitoring and Reporting Program (M&RP) which is included as an attachment to this Order, is intended to evaluate the performance of the corrective action program above and to satisfy Article 5, Water Quality Monitoring for the refinery's classified waste management units (WMU's). The WMU's subject to Chapter 15 Monitoring and Closure requirements at this refinery are the Class-II Landfill-15, Class-I Hydopits Landfill, Additives Plant/Plant-1 and the Landfarms. This Order establishes a water quality protection standard for those WMU's.
- 15. Approximately 11,000 linear feet of extraction trench, 5,700 linear feet of barrier wall, 18 extraction wells, 19,000 lineal feet of extraction piping, and one groundwater treatment plant have been installed as of the first quarter of 1993. The extracted groundwater will be treated in the Refinery effluent system and discharged in accordance with existing NPDES permit requirements. Pretreatment of extracted groundwater may be necessary for certain GPS segments and will be evaluated on a case-by-case basis.

#### Refinery Sectors

- 16. In order to provide phased implementation of the GPS and remediation goals, the discharger has subdivided the facility into nine geographic sectors, plus Pollard Landfill, (see Figure-4). Sector boundaries are generally defined by a physiographic boundary separating adjacent sectors, or by the refinery property line. The up gradient sector boundaries for the Alkane, North Yard, and Main Yard Sectors correspond to an inferred groundwater drainage divide, which is generally coincident with topographic drainage divides along San Pablo Ridge. The

up gradient sector boundaries for Landfarms/Landfills, Castro, and Reclamation Sectors are generally coincident with the Refinery property line. The Bayside Sector (North and South), includes all Chevron properties on the southwestern side of San Pablo Ridge and adjacent to San Francisco Bay.

17. Each sector has unique hydrogeology and varying degrees of environmental concern. The sectors are as follows:

- Landfarms/Landfills Sector
- Castro Sector
- Main Yard Sector
- North Yard Sector
- Bayside Sector - North
- Bayside Sector - South
- Alkane Sector
- Effluent Sector
- Reclamation Sector
- Pollard Landfill

With the exception of the Bayside Sector and the Pollard Landfill, all sites described in this Order are upgradient of the GPS.

18. The Refinery Tankfields (formerly called the Tank Farms), have been or are currently under hydrogeologic evaluation. A hydrogeologic investigation has been conducted for the following tank fields:

TANKFIELD	SECTOR	Report Date
Alkane	Alkane	9/30/91
Office Hill	Bayside South	9/30/91
S.P. Hill	Bayside South	9/30/91 & 4/30/93
Quarry	Bayside South	9/30/91
Point Orient	Bayside North	6/23/92
Asphalt	North Yard	6/23/92
Poleyard	North Yard	6/23/92
Main	Main Yard	12/31/92

The Alkane Tankfield is upgradient of the existing Alkane Sector GPS. Poleyard, Asphalt, and Main Tankfields will be within the capture zones of North Yard and Effluent Sectors' GPS. Point Orient, Quarry, S.P. Hill, and Office Hill Tankfields are within the Bayside Sector which does not have a GPS component.

#### **LANDFARMS\LANDFILLS SECTOR**

19. Landfill 15 is a 41 acre site, of which 13 acres is being operated as a Class-II Landfill for the primary purpose of placing designated waste from the Pollard site. Hazardous wastes such as separator sludge and paint sludge, were disposed of in the surface impoundment prior to the 1980's. Other wastes such as resins, water treatment sludges, catalyst fines, filter clays and

non-hazardous wastes such as clean fill, lime, dredge spoils and sulfur have also been disposed of at the landfill in the 1980's. A ROWD/SWAT for this site was submitted in May 30, 1989 and subsequently, a corrective action plan was submitted in 1991. A combination of physical and hydraulic barriers have been installed as part of the GPS system adjacent to this site. This site is subject to Chapter 15 and is under separate requirements by Order No. 92-010.

20. Old Drum Storage Facility was approximately 180 ft. by 90 ft., with a reported capacity of 2448 drums. The date of startup is unknown, but the facility was used for drum storage until December 1984. The unit was closed in accordance with the DHS approved closure plan "Closure Plan, Barrel Storage Facility, Richmond Refinery", dated May 7, 1986 and is now covered with an asphaltic concrete cap and has diversion ditches to channel runoff away from the site.
21. Landfill under Landfarms Numbered 2 and 3 The unit held approximately 80,000 cubic yards of waste material and is approximately 1200 ft. by 600 ft. The site was used for the disposal of various refinery wastes including concrete, clay pipe, oily tank sludges, and phthalic anhydride sludge. This site is completely within the bounds of both No.2 Landfarm and No.3 Landfarm and may be the source of the groundwater contamination found in 9 out of 19 wells completed in the A-zone. Landfilling at the present locations of Nos. 2 and 3 Landfarms was done in about 1977 and landfarming was begun in about 1980.
22. Landfarms The Landfarms are subject to EPA Order RCRA 09-88-0005. The Landfarms have not received waste since 1987 after which a closure plan was submitted on March 31, 1988. Pursuant to the consent agreement between the discharger and the EPA, the discharger has submitted the Bioremediation Assessment Report (BAR), dated February 28, 1992 and is preparing a sampling and analysis report to either optimize bioremediation or to modify the closure plan.

#### CASTRO SECTOR

23. Additives Plant / Plant 1 The discharger submitted a report "Investigation and Proposed Remedial Actions" dated February 2, 1990 for this site. The Additives Plant/Plant 1 have been completely dismantled. However, during operation of the facility, heavy metal-based gasoline additives were manufactured from about 1930 to 1970. Hazardous levels of Chlordane, DDT and soluble lead exist in the site's soil. This site is subject to the requirements of Site Clean-up Requirements Order No.90-146. This Board has given approval for the discharger to initiate a corrective action program for this site to include:
  - a. Encompass the site on three sides by the Castro Sector GPS,
  - b. Cover the site. The contaminated soils of the site will be covered by a combination of the Richmond Parkway, passing directly over the site, HDPE plastic and exposed asphaltic concrete on the non-roadway areas, and
  - c. The combined cover will provide a low permeability cap over the site and the encompassing GPS will prevent contaminated groundwater from leaving the site.
24. Heat Exchanger Bundle Cleaning Area This facility consisted of two concrete pits. The pits were used for temporary storage of heat exchanger bundle cleaning sludges originating from the accumulation of solids consisting of iron scale or coke on the shell or tube of the heat exchanger. The pits were approximately 6 feet deep, with walls extended above ground level about three feet. All wastes and the above ground part of the walls were removed to a Class-I hazardous waste disposal site. The remaining portions of the pit was subsequently filled with rock aggregate.

25. Phenol Plant The discharger submitted "Groundwater Investigation, Southeast Corner and Phenol Plant", April 22, 1992. The Phenol Plant was dismantled in 1991 and was located adjacent to the Refinery Gate 31 and bordered by Castro Street on the east and by General Chemical on the north.

#### MAIN YARD SECTOR

26. Main Tankfield The discharger submitted "Hydrogeologic Investigation, Main Tankfield", December 31, 1992. The tankfield is located along the southeast side of San Pablo Ridge and has had 133 aboveground petroleum storage tanks located on this site; about half of those have been dismantled. As of December 31, 1992, the tankfield consisted of 78 tanks, however only 41 tanks (total tankage volume of 4.2 million barrels) were active or in use, and 20 of those have leak detection bottoms.
27. Lake Mead is an unlined catchment basin used for storm water runoff from the central portion of the refinery. This area is currently used for the temporary containment of accidental spills, leaks, stormwater runoff, and tank hydrotesting water. The basin water is sent to the No.1A Separator before final treatment through the effluent system.
28. Lube/Marketing and Utilities/LPD Tankfields The discharger has submitted a Phase-1 Investigation Workplan, dated July 1, 1992 for this area. This Order provides that the discharger continue with the investigation and submit a report acceptable to the Executive Officer.

#### NORTH YARD SECTOR

29. Isomax Cooling Tower Currently, a network of recovery wells extract low pH water from this site and reclaim it by injecting it into the Cooling Tower for pH control. This site will be upgradient of the North Yard Sector GPS.
30. Tank Car Cleaning, Truck Wash, and Rail Car Loading (see Figure-4d for location). These units involve washdown of rail cars, tanks, and trucks and therefore have the potential for washwater, which may contain oily pollutants, to be discharged to the ground. All of these facilities are upgradient of the North Yard Sector GPS.
31. Pond 13 was used to store fluoride salts originating from the hydropits before the salts were removed for off-site disposal. The pond had a capacity of 28,000 cubic yards and was 500 feet in length, 450 feet in width and 4 feet in depth. The site was used for at least 40 years and it is believed that no wastes were disposed of in the impoundment since 1977. 7000 cubic yards of the fluoride salts in the pond were removed in 1980, and 35,000 cubic yards of contaminated soil were excavated in 1981. Wastes and soil were removed until the fluoride concentration in the remaining soils was less than 1800 ppm, as approved by the State Department of Health Services. This unit was filled with clean soil and is now the site of the Richmond Lube Oil Plant, built in 1984.
32. Tetraethyl Lead (TEL) Site was a 40 feet by 60 feet by 4 feet deep surface impoundment with a capacity of 300 cubic yards and was located south of the No.1 Oxidation pond. Up to 2,000 barrels per year of tank bottom sludges containing up to 100 ppm of tetraethyl lead were disposed of at this site during the 1970's. Approximately five feet of sludge and soils were removed from this site in 1980 and disposed of as hazardous waste. Organic lead was not detected in the remaining soils, however total inorganic lead was detected in the remaining soils at up to 189 ppm. Subsequent to the removal of the hazardous levels of lead, the No.1 Landfarm was expanded over the site.

33. Big Wheels Site was used as a holding area for slop oil emulsion prior to being landfarmed. It is located near the eastern end of No.1 Landfarm and was a pit measuring 40 feet in length, 15 feet in width, 4 feet in depth with a capacity of 80 cubic yards. In 1980, liquid wastes, solid wastes and contaminated soils from this site were removed and placed in the Landfarms, and subsequently backfilled with clean fill. The area is now level, covered with gravel and is used as part of a roadway around Landfarm No.1.
34. Landfill under Isomax and No.1 Landfarm holds approximately 400,000 cubic yards of waste material and clean fill in an area approximately 3000 feet by 500 feet wide along the southern shoreline of the No.1 Oxidation Pond. This area was used for the disposal of slop oil solids, separator sludge, leaded tank bottoms, and other wastes during early refinery operations. The date of startup and date of closure are unknown. This unit may be the source of floating petroleum hydrocarbons found in the groundwater monitoring wells and the soils in the area of Landfarm No.1. An RFI workplan was submitted in 1991 and revised in 1992 to evaluate this site. An RFI Report was submitted on November 24, 1992.
35. Oil Water Separators, No.'s 1, 1A, 2, 2A, 13, 15, and CPI have been used throughout the refinery to treat continuous flows of oily process water. Separators 1A and 2A were constructed in 1987 and have replaced Separators 1, 2, and 15 and CPI. The separators are operated so that oil is skimmed off the surface and returned to product tankage. Solids are allowed to settle to the bottom and the effluent is routed to the Bioreactor. Historically, the sludge, which is a listed hazardous waste, was periodically removed from these units and treated in the landfarms. Sludge is now disposed of off-site as a hazardous waste after volumetric reduction or recycled as a supplemental fuel.
36. No.1 Separator was constructed in 1912 and has a volume of 2.3 million gallons. The walls were constructed of concrete and the floor of brick. The wastes from this separator were removed in 1989 and subsequently backfilled with clean fill.
37. No.2 Separator was constructed in 1920 and had a volume of 560,000 gallons. The walls were constructed of concrete, however the floor construction material is unknown. The wastes were removed from this separator in 1988 and subsequently backfilled with clean fill.
38. No.15 Separator was built in 1950 and had a volume of 150,000 gallons. The walls and floor were constructed of concrete. The wastes were removed from this separator and subsequently backfilled with clean fill.
39. CPI Separator was 60,000 gallon separator built in 1976 and removed from service since 1991. It was predominantly an above-ground unit constructed of one-quarter-inch steel. The above ground portion has been dismantled and the unit has been backfilled with clean soil after the wastes were removed.
40. No.1 Oxidation Pond This pond, originally built in 1959, was separated into 5 compartments for the controlled sequential movement of waste water as a component of the effluent treatment process. For the purpose of this Order, Pass No.1 is discussed with the Effluent Sector below. Passes 2 through 5 are currently inactive but have received process water and storm water runoff. The main purpose of the Oxidation Pond was to provide surge capacity prior to discharge of the waste water to the Bioreactor, (also discussed with Effluent Sector below). The discharger performed sampling and analysis of the pond waters and sludges in 1985 and again in 1989 as part of a ROWD. The investigation determined that the pond sludges were non-hazardous but at concentrations which may pose a threat to water quality under ambient conditions. Benzene, ethylbenzene, toluene and xylene were found in the

sediments ranging in concentration to 40mg/kg, 23mg/kg, 30mg/kg and 140mg/kg, respectively, as well as several poly-aromatic hydrocarbons. Soluble metals were not encountered at significant concentrations. The sediments of this pond are considered by Board staff to be designated wastes. Pass No.1 has had its sediments removed and deposited into Passes 2 through 5 thereby "clean-closing" Pass No.1. The discharger submitted a report on January 18, 1991 summarizing the clean-up activities and sampling program conducted prior to converting Pass No.1 to a permitted clean stormwater impound.

41. Majka Ditch was used to transport storm water from the eastern part of the refinery to the No.2A Separator. Majka Ditch contained asphalt-like material on its sides which appeared to be a result of spills from the asphalt plant. There is no information regarding any historical use of this area for spills or waste containment. 300 cubic yards of contaminated soil were removed from the ditch in the fall of 1987. Soil sampling after removal of the waste indicated that in three out of nine samples, hazardous levels of lead or arsenic remained. A hydrogeologic investigation of Majka Ditch has been submitted in a report submitted to the RWQCB on September 7, 1990. This site is upgradient of the North Yard Sector GPS.
42. Poleyard Tankfield This tankfield is located adjacent to the Fluid Catalytic Cracking (FCC) Plant on the northeast side of San Pablo Ridge. There are 32 above-ground storage tanks in this tankfield, of which 24 were in service as of June 1992, with a total tankage volume of 2 million barrels; seven of the 24 tanks have leak detection bottoms. The tankfield area also contains Lake Rushing, Lake Schramm, and four other impound basins. Tank inspection records and aerial photographs indicate that hydrocarbon releases may have occurred from the Poleyard Tankfield. Monitoring well water analysis and observations of hydrocarbon contaminated groundwater seeping from the soils and bedrock, show that hydrocarbon contamination of the soil and groundwater is present at this tankfield. Accumulation of free-phase hydrocarbons has not been observed however, chemical analysis of the groundwater samples from the site's wells indicate that benzene, toluene, ethylbenzene, xylene and TPH exist at elevated levels.
43. Lake Schramm is a surface impoundment 400 feet by 100 feet by 8 feet deep and is located 2000 feet southwest of the No.1 Oxidation Pond. This unlined surface impoundment was used for the disposal of 600 cubic yards of leaded tank bottoms (13% oil, and 120 ppm lead) in 1980. It is not known whether the site was ever used for another purpose. 1300 cubic yards of material were removed from the site in 1981. In 1989, Lake Schramm began to undergo modifications related to the Storm Water Segregation Project which included removing additional contaminated soil. An investigation report for this site was submitted on October 31, 1989. Lake Schramm has been lined with asphaltic concrete and is currently being used to contain storm water runoff from the north-central portion of the Refinery.

#### BAYSIDE SECTOR

44. The Bayside Sector is separated into a northern sector and a southern sector. The Point Orient Tankfield and Sump 10 are located in the northern sector. At the present time, all of the tanks at the Point Orient Tankfield have been dismantled. The Southern Bayside Sector consists of three tankfields, known as the S.P. Hill Tankfield, Office Hill Tankfield and the Quarry Tankfield. This sector is generally located west of the Potrero-San Pablo Ridge with its steep topography usually open to the bay.
45. Groundwater occurs at a wide range of depths from as much as 150 feet below ground surface to occasional surface seeps. Water quality varies throughout the site but the best water quality can be found in Well No. 344F, in the S.P. Hill Tankfield and completed at about 90 feet of depth. The water from this well has total dissolved solids at about 670 mg/l.



46. S.P. Hill Tankfield Tank inspection records contain evidence that hydrocarbon releases have occurred from some tanks and pipelines in the S.P. Hill Tankfield. Shallow soils excavated along pipeways and adjacent to tanks locally contained high levels of hydrocarbon contamination and hazardous concentrations of metals, primarily lead. Hydrocarbon contamination and hazardous levels of lead and mercury were locally present in the berm fill and bottom soils of Basins 5, 6 and 7. It has been reported that much of the contaminated soil has since been removed from these basins, however residual contaminant concentrations within these basins have not been determined. The discharger has been issued Board Order No. 93-106 for the clean-up and abatement of the contaminated groundwater and removal of the free-phase hydrocarbons under this tankfield. The discharger has installed and is currently operating a free-phase hydrocarbon recovery system where hydrocarbons have been encountered.
47. Office Hill Tankfield This tankfield includes 20 tanks, 12 of which are in service and 4 of which have leak detection bottoms. The total tankage capacity of this tankfield is approximately 1.5 million barrels and currently contains mostly gas-oil or diesel. Several borings in the tankfield area, also known as Basin 4, encountered hydrocarbon contamination in the fill and estuary sediments to depths of 12 feet below the ground surface. Tank inspection records include historic evidence of possible releases from 1451, 1504 and 1506 into that basin. The discharger has installed and is operating a groundwater extraction system where hydrocarbons were encountered.
48. Quarry Tankfield This tankfield includes 14 tanks of which only 3 have leak detection bottoms. The total tankage capacity of this tankfield is approximately 5.6 million barrels and currently contains mostly crude oil and refined lube oil. Part of this tankfield occupies a previously quarried southwestern section of San Pablo Ridge and is located adjacent to the existing American Rock and Asphalt quarry.
49. Point Orient Tankfield In 1990 tanks in this area were taken out of service, dismantled and contaminated soils removed. There is no evidence of accumulations of free-phase hydrocarbons on the water table along the perimeter of the tankfield. However, based on observations of hydrocarbon-contaminated soil beneath the former tanks, some of the tanks in this area may have leaked petroleum in the past. The discharger submitted a hydrogeologic investigation for this tankfield on June 23, 1992 which determined that minor soil and groundwater contamination exists at the No.10 Sump area as described below.
50. 10 Sump is an unlined catchment basin which collects storm water runoff from the former Point Orient Tankfield. Historic aerial photos suggest hydrocarbon releases may have occurred in the past. Groundwater analysis from monitoring wells at this site show diesel contamination at concentrations of up to 1.7 mg/l. Soil analysis show contamination of up to 3,000 mg/kg diesel and up to 12 mg/kg organic lead.

#### ALKANE SECTOR

51. In conjunction with an approved closure plan, Chevron has installed a GPS system along the shoreline of the Alkane Sector and along the downgradient perimeter of the Hydropits, consisting of an extraction trench, slurry wall and extraction wells. The discharger has proposed that the GPS will provide corrective action for the upgradient sites of this sector.
52. Sulfur Recovery Unit (SRU) Settling Basin The SRU Basin is located west of the SRU No.1. The basin is concrete lined and was constructed in 1973-1974. It is approximately 10 feet by 6 feet and 8 feet deep and has a capacity of 3590 gallons. The basin receives sulfate and sulfurous solutions from the sulfur recovery unit. These streams typically have a pH of about 5

to 6. Fluid from the settling basin is routed to the wastewater treatment system. In the past, the pH of this waste stream was monitored and adjusted in the basin. There have been no known releases from this unit.

53. Mud sump This site is located southwest of No.13 Separator and has been out of service since the early 1970's. The wastes have since been removed and the sump was backfilled with clean soil. The sump was a low, unlined depression in the ground adjacent to No.13 Separator which was used for storage of mud and solids that settled on the bottom of the separator.

54. Hydrofluoric Acid Pits (Hydropits) The discharger has submitted a closure certification report for the closure of the Hydropits dated November 23, 1992. Closure activities have included excavating soil to a depth of 6 feet beneath Schaeffer Slough and disposal of the excavated soils within the Hydropits. The unit no longer contains liquid or hazardous waste and as such, meets the cease discharge requirements of the Toxic Pits Cleanup Act.

55. Schaeffer Slough was a ditch which carried the effluent from the hydropits to the No.13 oil/water separator for eventual discharge to the waste water treatment system. The slough was 450 feet long with a width of 6 feet and a depth of 4 feet. Schaeffer Slough has been closed, as confirmed by the Boards letter dated March 17, 1989.

56. No.13 Separator was constructed in 1944 and has a total volume of 960,000 gallons.

57. Alkane Plant The discharger has installed two groundwater extraction wells at this site for the extraction/recovery of benzene contaminated water for treatment prior to discharge to the refinery's effluent system. Approximately 60,000 gallons of water per month are treated prior to disposal.

58. Pond 13A The discharger has included this site in the Amended Closure Plan Detailed Design-Hydrolyzing Pits (February 28, 1992) proposing GPS as the corrective action for this site. Hydrolyzing Pits Closure Plan was approved April 10, 1992. As specified in the approved closure plan, Pond 13A has been clean-closed. Contaminated soils have been placed in the hydropits which has been closed as of November 23, 1992.

59. Stormwater Sump collected stormwater runoff from nearby process areas. The discharger's water segregation project has resulted in this sump being taken out of service and lined. The sump was located approximately 100 feet north of the Hydropits and consisted of a trench, approximately 100 feet long, 3 feet wide and 8 feet deep. The eastern end of the sump was equipped with a lift pump which discharged to the wastewater treatment pond. This site is upgradient of the Alkane Sector GPS.

60. Alkane Sector GPS excavated to approximately -40 feet MSL by the discharger in the early 1990's, the GPS consisted of a 30 acre pond in which all of the Refinery's secondary wastewater treatment effluent is discharged. The GPS is enhanced by aerators and pond baffles. Sampling and analysis of GPS waters in 1985 and 1989 determined that it did not contain hazardous wastes, however, the GPS is designated for the disposal of these wastes. The Effluent Treatment System, which treats these wastes to be designated wastes. The Effluent Treatment System, which treats these wastes to be designated wastes. The Effluent Treatment System, which treats these wastes to be designated wastes. The Effluent Treatment System, which treats these wastes to be designated wastes.

61. Bay Area This 90 acre pond was built in 1963 and is being used for final polishing of the effluent prior to discharge to the Bay. Sampling and analysis of the pond waters and sediments determined that this pond does not contain hazardous wastes. No.2 Oxidation

pond has been converted into a pilot waste water enhancement/wetlands and is a Point Of Compliance for the refinery's NPDES permit. A portion of the treated Bioreactor outlet water is directed through this marsh for final tertiary treatment or "polishing". The Effluent Treatment System, Report of Waste Discharge was submitted for this site on August 28, 1989 and was approved July 12, 1990.

62. The 250 Foot Channel This 25 acre site was excavated to - 40 feet MSL in the early 1900's. The use of this facility for wastewater management commenced in the 1950's when the dam at the outlet of the channel was built. The 250 Foot Channel was used as the final conduit for waters discharged to the Bay. Once-through-cooling water, mixed with water from the No.2 Oxidation Pond and from Chevron Chemical Company's ultimate discharge passes through this channel and is discharged to the Bay under NPDES permit number CA0005134. Currently, stormwater from Castro Street, the Refinery and once-through-salt-cooling water also passes through this unit. Sampling and analysis of this channel in 1985 and 1989 for the ROWD determined that it did not contain hazardous wastes, however Board staff considers the sediments to be designated waste. The Effluent Treatment System Report of Waste Discharge was submitted for this site on August 28, 1989 and was approved July 12, 1990.
63. The 50/100 foot channel is a narrow collection channel located in the southern part of the refinery. Sampling and analysis of the wastes in this channel in 1985 found the wastes to be non-hazardous. With the installation of the new oil/water separators, this channel is no longer used to conduct process water to the bioreactor. Instead, and with Board approval, the discharger has cleaned the channel and converted it for use in conducting non-contaminated storm water runoff to the Bay after appropriate sampling pursuant to NPDES permit number CA0005134.
64. Pond 11 This site received waste from the Drum Reconditioning Plant. It is believed that the discharge was an oily waste stream from the plant which may have contained some paint sludge. The wastewater was allowed to settle in the pond and the sludge subsequently hauled off-site for disposal. The pond's dimensions were 150 feet in length, 50 feet in width and 4 feet in depth. There are no details on the construction of the pond. The wastes were completely removed in 1979 and the site was backfilled with clean fill and leveled. This unit was located adjacent to the Bioreactor.
65. Pond 14 This site also received waste from the Drum Reconditioning Plant from 1969 to 1979. Drums were washed in a caustic solution and large amounts of water to remove the paint and the paint sludge which was then transferred to the pond. Solids accumulated in the bottom of the impoundment, while the overlying water was allowed to overflow through a weir structure and enter the waste water treatment ponds. Solids were removed annually and disposed of off-site. Prior to 1969 the pond was used for disposal of magnesium hydroxide and calcium carbonate generated by the Spaulding precipitator unit. The pond has a capacity of 4,300 cubic yards, and is triangular in shape with dimensions of 220 feet on all sides and 5 feet in depth. In the fall of 1980 all wastes were removed from the pond as well as some of the underlying soils. Wells placed around the unit have not shown evidence of significant groundwater contamination.

## RECLAMATION SECTOR

66. Reclamation Yard Site is located northeast and adjacent to the No.2 Oxidation Pond. This property has been identified as the location of the former City of Richmond Municipal landfill site. A review of aerial photography indicates that the site was in operation as early as 1947. Chevron U.S.A. purchased the site in 1958. The site is 1350 feet by 500 feet with a depth of waste of approximately 7.5 feet (187,500 cubic yards). The discharger submitted a ROWD on May 26, 1989, a Reclamation Sector GPS Master Plan on December 10, 1991, and a Phase II Investigation summary report submitted on February 10, 1992. In addition, the discharger has submitted to this Board and to the U.S. EPA a Reclamation Sector RCRA Facilities Investigation Workplan dated July 16, 1992 which includes the Reclamation Yard, Gertrude Street site, and the PARR-Richmond site.
67. PARR-Richmond Site This site was acquired by the discharger in 1954 from the Parr-Richmond Industrial Corporation and subsequently leased the area for livestock grazing until 1968. The 24 acre site is located north of Gertrude Street and adjacent to Wildcat Creek. In addition, the discharger has submitted to this Board and to the U.S. EPA a Reclamation Sector RCRA Facilities Investigation Workplan dated July 16, 1992 which includes the Reclamation Yard, Gertrude Street site, and the PARR-Richmond site.
68. Gertrude Street Site This site is approximately 150 feet by 800 feet and is located north of Gertrude Street in the eastern portion of the Reclamation Sector. The date of startup is unknown, but the discharger purchased the property in 1961 and continued to lease the site to the Bonner Brothers, who operated an auto dismantling and drum reconditioning until 1984. Subsequently, the discharger disposed of the above ground barrels, the scrap metal, junk cars, and miscellaneous debris to an appropriate disposal site. 103 buried drums were also found at the site and removed to an appropriate waste disposal site. During 1985, 60 composite soil samples were collected from the site prior to its conversion to a stormwater runoff containment sump. The results of soil sampling detected leachable quantities of lead above hazardous values, and various priority and non-priority pollutants including, PCB's, pesticides, and petroleum hydrocarbons. The soil sampling did not define the lateral and vertical extent of waste migration at the site. Three groundwater monitoring wells installed along the western boundary of the site, were sampled semi-annually as part of the Refinery-wide Groundwater Monitoring Program (RGMP). A ROWD workplan was submitted on September 25, 1989. Additional information on this site was contained in a summary report on the Reclamation Sector (titled Phase II Investigation Reclamation Sector), submitted to the Board on February 10, 1992. The Gertrude Street Site ROWD was deferred by the discharger in 1989 while the GPS was developed for the Reclamation Sector. A GPS Master Plan for the Reclamation Sector included this site and was submitted on December 10, 1991. In addition, the discharger has submitted to this Board and to the U.S. EPA a Reclamation Sector RCRA Facilities Investigation Workplan dated July 16, 1992 which includes the Reclamation Yard, Gertrude Street site, and the PARR-Richmond site.
69. Pollard Landfill This site is regulated by Order No. 91-098 issued on June 19, 1991, and will be remediated and closed pursuant to that Order.
70. Section 13227 of the Water Code requires the Board to review closure plans submitted pursuant to Section 25246 of the Health and Safety Code for hazardous waste facilities in order to assure adequate protection of water quality. The Board may condition its approval of these closure plans.

#### Basin Plan

71. The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on December 11, 1991. The Basin Plan contains water quality objectives and this Order implements the water quality objectives stated in the Basin Plan.
72. The beneficial uses of San Pablo Bay and San Francisco Bay in the vicinity of the site are:
  - a. Industrial service supply;
  - b. Navigation;
  - c. Contact and non-contact water recreation;
  - d. Commercial and sport fishing;
  - e. Wildlife and estuarine habitat;
  - f. Preservation of rare and endangered species;
  - g. Fish migration and spawning;
  - h. Shellfish harvesting; and,
  - i. Estuarine habitat.
73. The potential beneficial uses of groundwater underlying the site which is deeper than 100 feet are:
  - a. Industrial process water and service supply;
  - b. Agricultural supply; and,
  - c. Municipal and Domestic Supply.

The shallow water-bearing zones beneath the site have varying water qualities. The specific beneficial uses and appropriate groundwater quality protection standards for these shallow water bearing zones will be determined for each water bearing zone based on technical information to be developed during any investigative or remedial action plan approval process.

#### California Environmental Quality Act

74. The action to issue waste discharge requirements for continued operation of existing waste management units and for closure of waste management units is exempt from the California Environmental Quality Act (Public Resources Section 2100 et. seq.) in accordance with Section 15301 of the California Administrative Code.
75. State Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California" On October 28, 1968, the State Water Resources Control Board adopted a resolution which calls for maintaining the existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses.
76. Regional Board Resolution No. 88-160, "Regional Board Position on the Disposal of Extracted Groundwater From Groundwater Clean-up Projects" On October 19, 1988, the San Francisco Bay Regional Water Quality Control Board adopted a resolution to encourage dischargers to recycle, in some beneficial manner, any groundwater that has been extracted and remedied of contaminants. In addition, the resolution encourages minimization of the discharge of treated water to local receiving waters under a site's NPDES permit whenever possible.
79. Unless otherwise noted, any references to Sections and Articles refer to Chapter 15, Division 3, Title 23 CCR.
80. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, that the discharger and any other persons that own the land or operate these units shall meet the applicable provisions contained in Division 7 of the California Water Code and regulations adopted thereunder and shall comply with the following:

A. Prohibitions

1. The discharge, storage, or treatment of waste, or materials which may impact the beneficial uses of the ground and surface water, shall not be allowed to create a condition of pollution or nuisance as defined in Sections 13050 (l) and (m), of the California Water Code.
2. The discharge of pollutants onto land that has a potential to impact groundwater or surface waters, except as permitted under the National Pollutant Discharge Elimination System, or site specific Waste Discharge Requirements is prohibited.

B. Specifications

1. The discharger shall extract water from the GPS trench to a practical level acceptable to the Executive Officer. The net effect shall be to cause a groundwater gradient into the extraction GPS system, such that the bayward migration of contaminants is eliminated or reversed. The volume of water extracted at steady-state conditions shall be reported on a gallons-per-day basis. The discharger shall install a physical barrier downgradient of any extraction well(s) or extraction trench that is producing Bay water at volumes deemed to be unacceptable by the Executive Officer.
2. The discharger shall monitor the "A Zone" for contaminants on the downgradient side of the GPS trench/barrier and groundwater levels on both sides of the GPS trench/barrier for the primary purpose of evaluating the effectiveness of the GPS.
3. The discharger shall perform free phase liquid petroleum hydrocarbon recovery activities, as needed, to remove free phase petroleum hydrocarbons from beneath the facility. The discharger shall propose the methods to achieve this specification and the degree of cleanup but the proposal must be acceptable to the Executive Officer.
4. All aboveground petroleum storage tanks, subject to Chapter 6.67, §25270 of the Health and Safety Code, shall comply with all provisions of that section and Part 112 of the Federal Code Of Regulations. All tanks shall be adequately monitored to assure that petroleum products will not discharge to surface and subsurface waters of the State. All tanks not fitted with leak detection bottoms, or with a tank monitoring system/method approved by the Executive Officer, shall have, in the interim, their tank bottoms tested for integrity and thickness. The inspection time interval shall be between five to ten years and dependant on the likelihood of tank bottom corrosion and the age of the tank.

All containment structures shall be designed by, and constructed directly under the supervision of and certified by, a registered civil engineer or a certified engineering geologist.

The discharger shall continue to operate any contaminant extraction system as long as it is to achieve compliance with this Order.

Soil and groundwater samples shall be analyzed by State certified laboratories or laboratories accepted by the Board using approved EPA methods for the type of analyses to be performed. All laboratories shall maintain quality assurance/quality control records for Board staff review.

8. The discharger shall maintain in good working order, and operate, as efficiently as possible, any facility or control system installed to achieve compliance with the requirements of this Order.
9. Groundwater Conservation The discharger shall consider the feasibility of reusing all extracted groundwater resulting from any remedial activity, as specified in Board Resolution No. 88-160.
10. Any classified Waste Management Units (WMU's), as determined in any separate site or sector specific Order shall be closed according to a closure and post-closure maintenance plan approved by the Executive Officer. The plan shall comply with applicable Article 5, Water Quality Monitoring, and Article 8, Closure and Post-Closure Maintenance requirements
11. All closure activities shall be under the direct supervision of a registered civil engineer or a certified engineering geologist.
12. Closed WMU's shall be provided with at least two permanent monuments installed by a licensed land surveyor or a registered civil engineer, from which the location and elevation of wastes, containment structure integrity, and identity/elevations of monitoring facilities can be determined throughout the post-closure maintenance period.
13. If vegetation is proposed to be incorporated into any final WMU cover, specific design considerations shall be incorporated into the closure plan to minimize infiltration of irrigation water. The variety of vegetation shall be selected such that the integrity of any containment structure, including the final cover, will not be impaired.
14. Sector-specific groundwater monitoring plans shall comply with Article 5 or shall otherwise be acceptable to the Executive Officer.
15. WATER QUALITY PROTECTION STANDARD - Pursuant to Article 5, §2550.2 the Constituents of Concern and respective Concentration Limits are specified in this Order to be a component of the Monitoring and Reporting Program (M&RP), Attachment 1. The Point of Compliance is a vertical surface located at the hydraulically downgradient limit of the WMU which generally coincides with the GPS, where present. The monitoring points for the Point of Compliance of each WMU shall be specified in the M&RP.
16. The discharger is in the process of implementing the GPS as a Corrective Action Measure for remediation of groundwater contamination along the San Pablo Bay side of the Refinery. The discharger shall operate the corrective action measure for one year after compliance has been achieved with the Concentration Limits established by this Order before any reduction or termination of groundwater extraction is allowed, see M&RP attached.
17. If it is determined by the Executive Officer, based on groundwater monitoring information, that water quality impairment outside of the GPS is not improving, or continues to degrade, the discharger may be required to submit additional site specific groundwater corrective action proposals.
18. Pursuant to §2550.8(e) of Article 5, the discharger has proposed a list of monitoring parameters, frequency of sampling and frequency of reporting for the refinery's WMU's. As provided by Article 5, the proposed list shall include those physical parameters,

hazardous constituents, waste constituents, and reaction products that provide a reliable indication of a release from the WMU's to adjacent mediums. The monitoring parameters are listed by sector as an appendix of the M&RP attached. The discharger shall monitor for all Constituents of Concern and for each Monitoring Parameter at intervals determined in the M&RP.

19. The discharger shall implement any Monitoring and Reporting Program (M&RP) issued by the Executive Officer. The purpose of the M&RP is to detect, at the earliest opportunity, any unauthorized discharge of waste constituents from the WMU's, or any unreasonable impairment of beneficial uses associated with the Refineries past and present activities.
  20. The discharger shall not cause the release of pollutants, or waste constituents in a manner which could cause a condition of contamination, pollution, or nuisance to occur, as indicated by the most appropriate statistical [or non-statistical] data analysis method and retest method listed in Part III of the attached Monitoring and Reporting Program.
  21. Water Quality Protection Standard (Standard) for Detection Monitoring. The five parts of the Water Quality Protection Standard of §2550.2 of Article 5 are as follows:
    - a. Constituents of Concern [§2550.3 of Article 5], are a list of contaminants which are most likely to be present in the groundwater at the site. The Constituents of Concern are specified in Appendix II of the M&RP.
    - b. Concentration Limits [§2550.4 of Article 5]. For each Monitoring Point assigned to a Detection Monitoring Program [M&RP Part II.C.4.], the Concentration Limit for each Constituent of Concern is listed in Appendix II of the M&RP attached.
    - c. Point of Compliance [§2550.5]. The Point of Compliance is shown on Figure M&RP-1, and extends down through the Zone of Saturation [§2601 of Article 10] for each WMU.
    - d. Monitoring Points and Background Monitoring Points for Detection Monitoring [§2550.5 of Article 5] shall be those listed in Appendix I of the attached M&RP.
  22. Additional Monitoring Points or Background Monitoring Points. If the Executive Officer determines the existence of an imminent threat to surface or subsurface waters of the State, the discharger may be required to install additional ground water, soil pore liquid, soil pore gas, or leachate monitoring devices.
- At any time, the discharger may file a written request [including appropriate supporting documents] with the Regional Board Executive Officer, proposing appropriate modifications to the Monitoring and Reporting Program. The request may address changes (a) to any statistical method, non-statistical method, or retest method used with a constituent or parameter, (b) to the manner of determining the background value for a constituent or parameter, (c) to the method for displaying annual data plots, (d) to the laboratory analytical method used to determine the background value for a constituent or parameter, (e) to the addition of a constituent or parameter to the media being monitored, (f) to the number or placement of Monitoring Points for a given constituent or parameter, (g) to the number or placement of Monitoring Points for a given constituent or parameter, (h) to the number or placement of Monitoring Points for a given constituent or parameter, (i) to the number or placement of Monitoring Points for a given constituent or parameter, (j) to the number or placement of Monitoring Points for a given constituent or parameter, (k) to the number or placement of Monitoring Points for a given constituent or parameter, (l) to the number or placement of Monitoring Points for a given constituent or parameter, (m) to the number or placement of Monitoring Points for a given constituent or parameter, (n) to the number or placement of Monitoring Points for a given constituent or parameter, (o) to the number or placement of Monitoring Points for a given constituent or parameter, (p) to the number or placement of Monitoring Points for a given constituent or parameter, (q) to the number or placement of Monitoring Points for a given constituent or parameter, (r) to the number or placement of Monitoring Points for a given constituent or parameter, (s) to the number or placement of Monitoring Points for a given constituent or parameter, (t) to the number or placement of Monitoring Points for a given constituent or parameter, (u) to the number or placement of Monitoring Points for a given constituent or parameter, (v) to the number or placement of Monitoring Points for a given constituent or parameter, (w) to the number or placement of Monitoring Points for a given constituent or parameter, (x) to the number or placement of Monitoring Points for a given constituent or parameter, (y) to the number or placement of Monitoring Points for a given constituent or parameter, (z) to the number or placement of Monitoring Points for a given constituent or parameter.
- After receiving and analyzing such a report, the Executive Officer shall reject the proposal for reasons listed, or shall incorporate it – along with any necessary changes – into the attached Monitoring and Reporting Program.



C. Provisions

1. ALL SECTORS
  - a. The discharger shall comply with the Specifications of this Order regarding operating standards for the GPS.
  - b. The discharger shall implement the sector GPS according to the schedule in Appendix I.
  - c. The discharger shall submit and implement a Corrective Action Proposal for any area that the Executive Officer considers an imminent threat to surface or subsurface waters of the State.
2. LANDFARMS/LANDFILL-15 SECTOR
  - a. The discharger shall comply with Board Order #92-010 with respect to Landfill 15.
  - b. The discharger shall comply with EPA Consent Agreement RCRA 09-89-0010 and its amendments with respect to the Landfarms.
3. CASTRO SECTOR  
The discharger shall comply with Order #90-146 in regards to the Additives Plant/Plant 1.
4. MAIN YARD SECTOR  
The discharger has submitted a groundwater investigation proposal for the Lube/Marketing and Utilities/LPD Tankfield. The discharger shall submit to this Board a groundwater investigation report for that tankfield approvable the Executive Officer.  
REPORT DUE DATE: October 15, 1993
5. ALKANE SECTOR
  - a. The discharger shall comply with the Alkane Sector Site Clean-up Order No. 92-092 issued August 19, 1992.
  - b. The discharger shall monitor the Alkane Sector GPS as approved by this Board on November 20, 1992.
  - c. The discharger shall comply with Cease and Desist Order #91-098 with regard to the Hydropits.
6. S.P. HILL TANKFIELD - The discharger shall comply with the Bayside Sector/ S.P. Hill Tankfield Site Clean-up Order No. 93-016 issued February 17, 1993.
7. POLLARD LANDFILL  
The discharger shall comply with Cease and Desist Order 91-098 and with the Specifications of this Order.
8. Pursuant to Specification B.4, the discharger shall submit a time schedule acceptable to the Executive Officer to inspect all tank bottoms of tanks which are without an acceptable leak detection system in place and operational. The inspections shall take into account the age of the tank, the interval since last inspected and the corrosive nature of the contents of the tank.  
REPORT DUE DATE: November 15, 1993

9. The discharger shall obtain and maintain the following Financial Assurance Instrument until the end of the Post-Closure Maintenance Period for any classified waste management unit subject to Article 5 requirements. The Discharger shall submit a report every five years that either validates the Instrument's ongoing viability or proposes and substantiates any needed changes [e.g., a documented increase in the monitoring systems' ability to provide reliable early detection of a release can cause a decrease in the Instrument's financial coverage].  
REPORT DUE DATE: Within five years of the date of adoption of this Order, and every five years thereafter.
10. The discharger shall permit the Board, or its authorized representative, in accordance with Section 13267(c) of the California Water Code:
- Entry upon premises in which any pollution sources exist, or may potentially exist, or in which any required records are kept, which may be relevant to the Order.
  - Access to copy any records required to be kept under the terms and conditions of this Order.
  - Inspection of any monitoring equipment of methodology implemented in response to this Order.
  - Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.
11. The discharger shall file with this Board a report of any material change or proposed change in the character, location, or quantity of this waste discharge. For the purpose of these requirements, this includes any proposed change in the boundaries, contours, or ownership of any disposal area.
12. The discharger shall notify this Board of any soil contamination discovered during any subsurface investigations conducted on the refinery property, which may potentially have an adverse impact on ground or surface waters.
13. The discharger shall notify this Board of any reportable quantity, (42 gallons or more), of oil or petroleum product spilled or leaked from the facility to any ground surface not protected by a non-permeable barrier. Verbal notification of the spillage shall be within one working day of knowledge of the spill and shall be followed up with a written description of the spill to include the nature and volume of spillage, total area and/or soil volume affected and location of spillage.  
REPORT DUE DATE: Effective January 1, 1994 and Within 14 calendar days from occurrence of the spill
14. If the discharger has commenced work under a program or plan approved by the Executive officer and is in compliance with the schedule of work under that program or plan, then the discharger shall be deemed to be in full compliance with the program or plan even though all of the work or tasks to ultimately be performed have not been completed.
15. The discharger shall maintain a copy of this Order at this site so as to be available at all times to site operating personnel.
16. The Board considers the property owner and site operator to have a continuing responsibility for correcting any problems within their reasonable control which arise in the

future as a result of this waste discharge or water applied to this property during subsequent use of the land for other purposes.

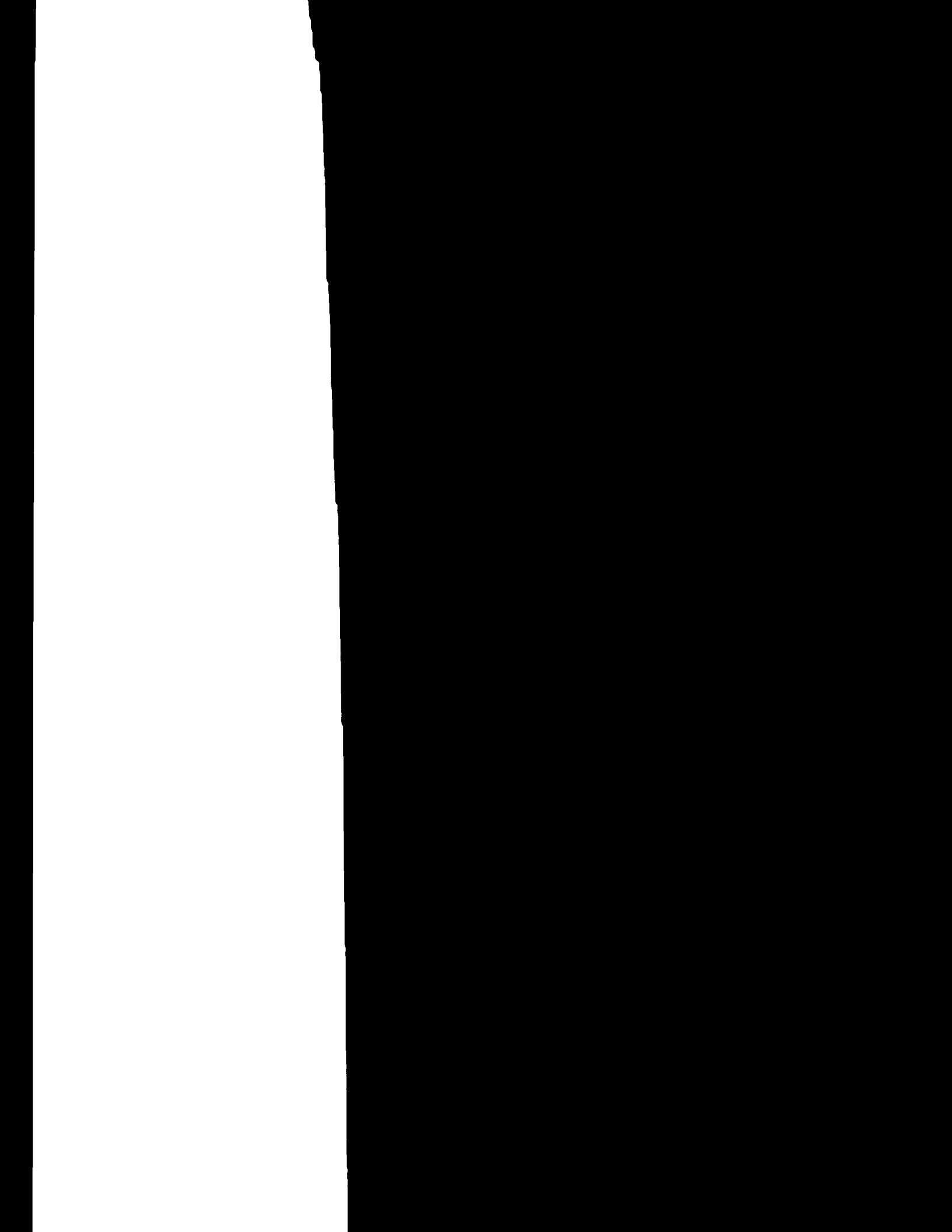
17. These requirements do not authorize the commission of any act causing injury to the property of another or of the public, do not convey any property rights, do not remove liability under federal, State or local laws, and do not authorize the discharge of waste without the appropriate Federal, State, or local permits, authorizations, or determinations.
18. If the discharger is delayed, interrupted or prevented from meeting one or more of the time schedules in this Order due to circumstances beyond their reasonable control, the discharger shall promptly notify the Executive Officer. In the event of such delays, the Board will consider modification of the time schedules established in this Order.
19. The Discharger shall implement any Monitoring and Reporting Program issued by the Executive Officer.
20. This Order supersedes Order No. 89-175. Order 89-175 is hereby rescinded.

I, Steven R. Ritchie, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order of the California Regional Water Quality Control Board, San Francisco Bay Region, on September 15, 1993.

  
STEVEN R. RITCHIE  
Executive Officer

Attachments:

- Figure 1 Site Map
- Figure 2 Vicinity Map
- Figure 3 Geomorphic Boundary Map
- Figure 4 Sector Boundary Maps
- Figure 4a Landfills/Landfills Sector Boundary Map
- Figure 4b Castro Sector Boundary Map
- Figure 4c Main Yard Sector Boundary Map
- Figure 4d North Yard Sector Boundary Map
- Figure 4e Bayside Sector Boundary Map
- Figure 4f Bayside Sector Boundary Map - North
- Figure 4g Bayside Sector Boundary Map - South
- Figure 4h Alkane Sector Boundary Map
- Figure 4i Effluent Sector Boundary Map
- Figure 5 Reclamation Sector Boundary Map
- Appendix I Pollard Pond Landfill Site Map
- ch. 1 Schedule for GPS Construction and Start-up Monitoring & Reporting Program

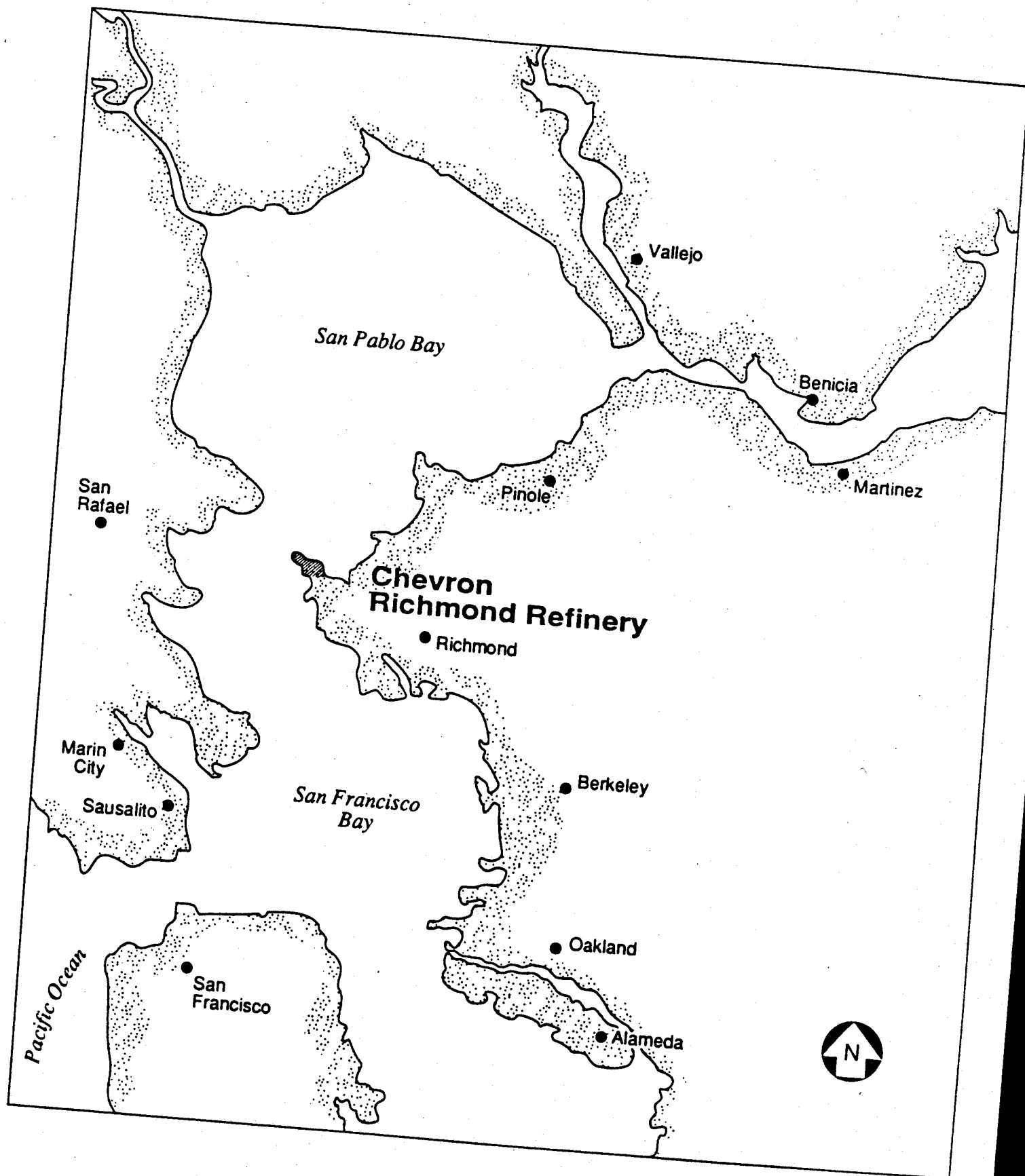


# APPENDIX I

## SECTOR GPS/CORRECTIVE ACTION IMPLEMENTATION SCHEDULE

SECTOR	PROPOSAL SUBMITTAL	COMPLETE INSTALL	START-UP DATE
LANDFARMS/LANDFILL	07/01/91		
CASTRO	04/29/92	04/01/94	10/01/94
MAIN YARD	a	04/01/94	10/01/94
NORTH YARD	11/ /92	a	a
BAYSIDE - NORTH	a	04/01/94	10/01/94
BAYSIDE - SOUTH (S.P.HILL)	11/ /93	a	a
ALKANE	03/30/90	3/ /94	5/ /94
EFFLUENT	a	09/ /92	12/ /92
DECLAMATION - Phase-I	12/10/91	a	07/01/94
DECLAMATION - Phase-II	12/10/91	12/31/93	12/01/94
		06/31/94	

The Executive Officer may administratively impose on the discharger to provide a GPS component or Corrective Action at this sector at a later date.



**LOCATION MAP**  
Chevron Richmond Refinery



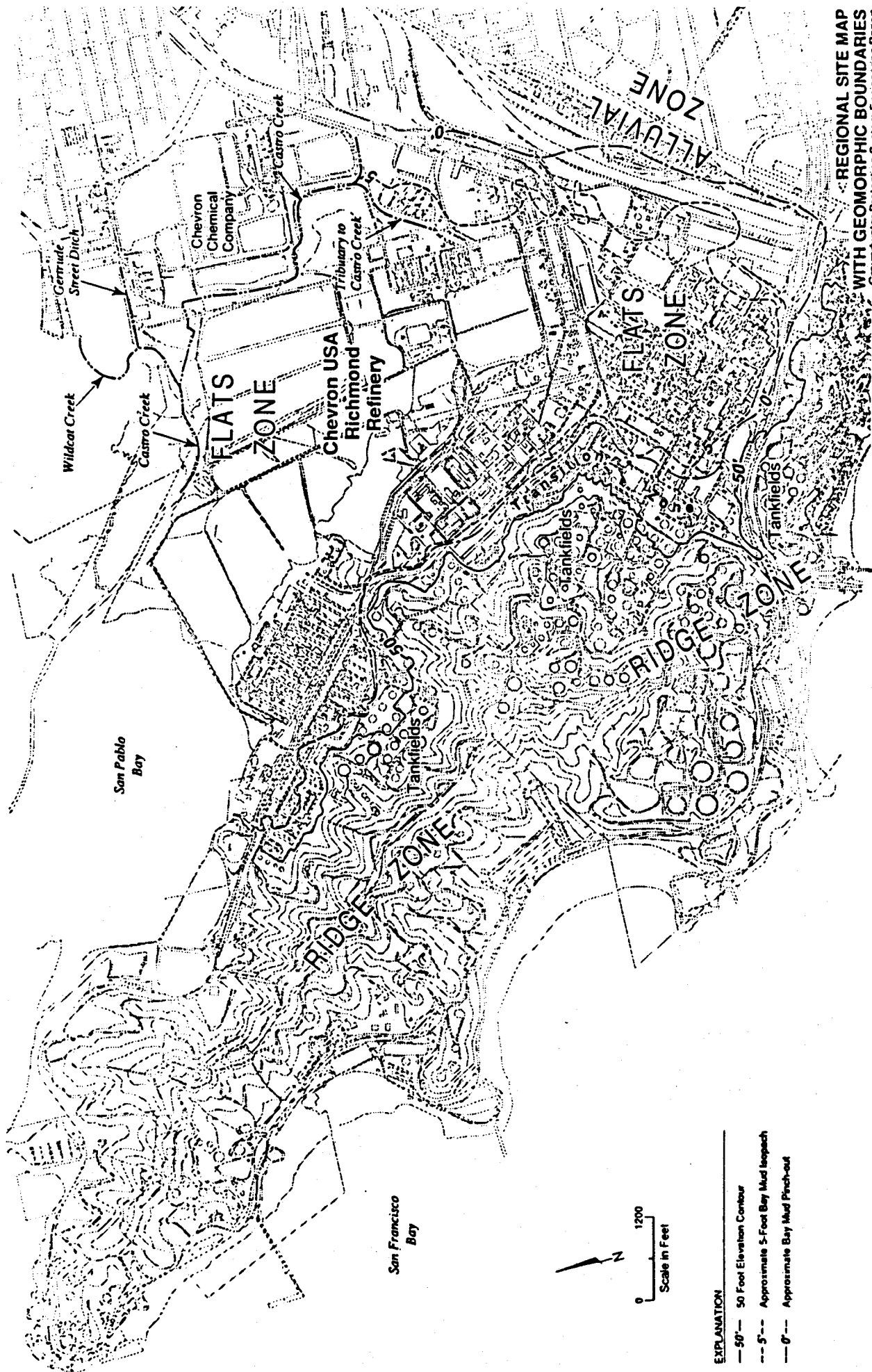
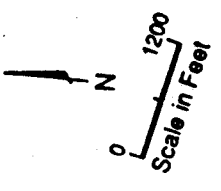


Figure 3 Geomorphic Boundary Map

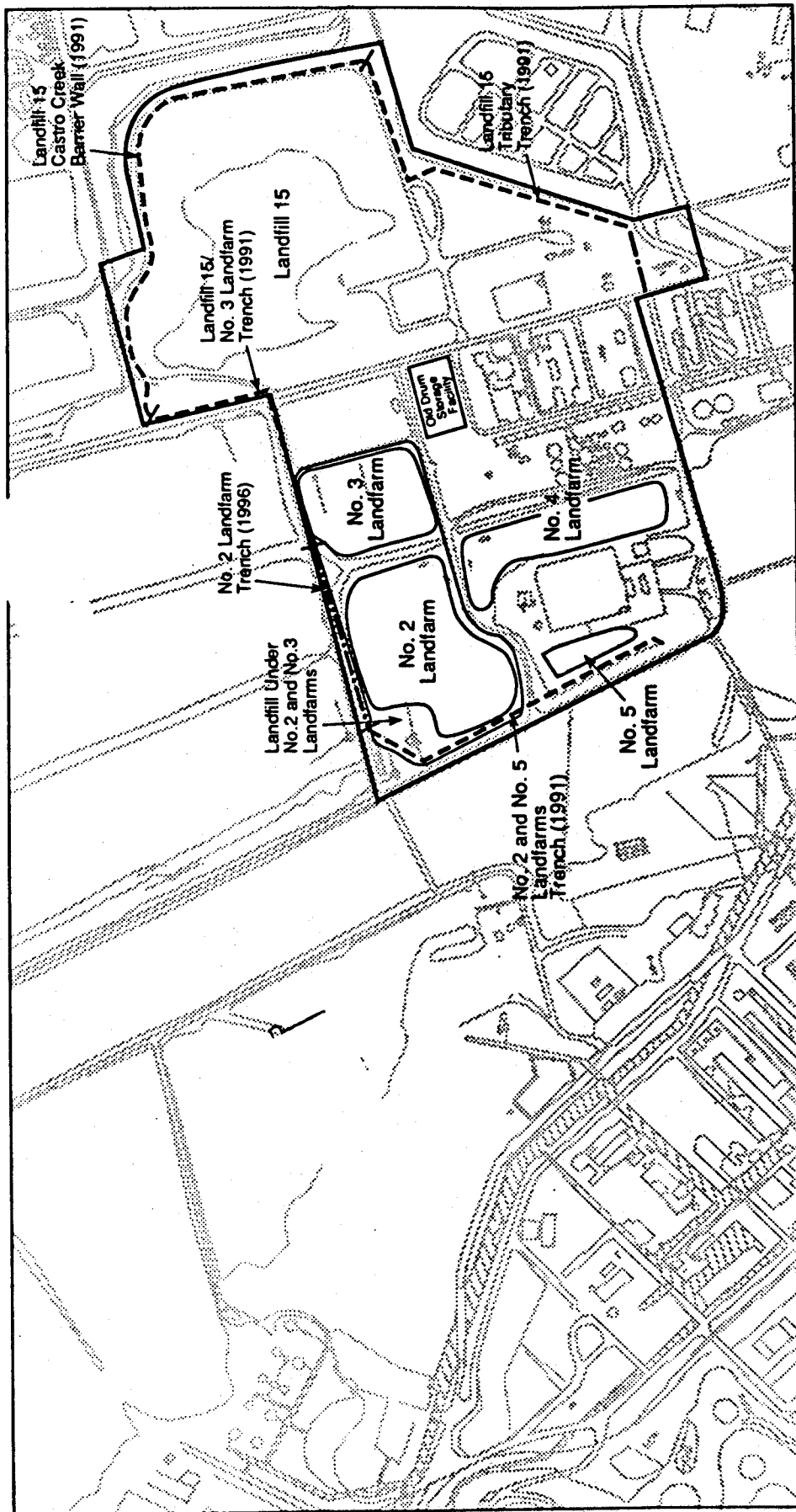




**SECTOR BOUNDARIES**  
Richmond Refinery, California  
Waste Discharge Requirements  
Figure 4 Sector Boundary Map

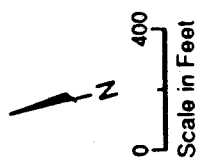


**EXPLANATION**  
— Sector Boundary



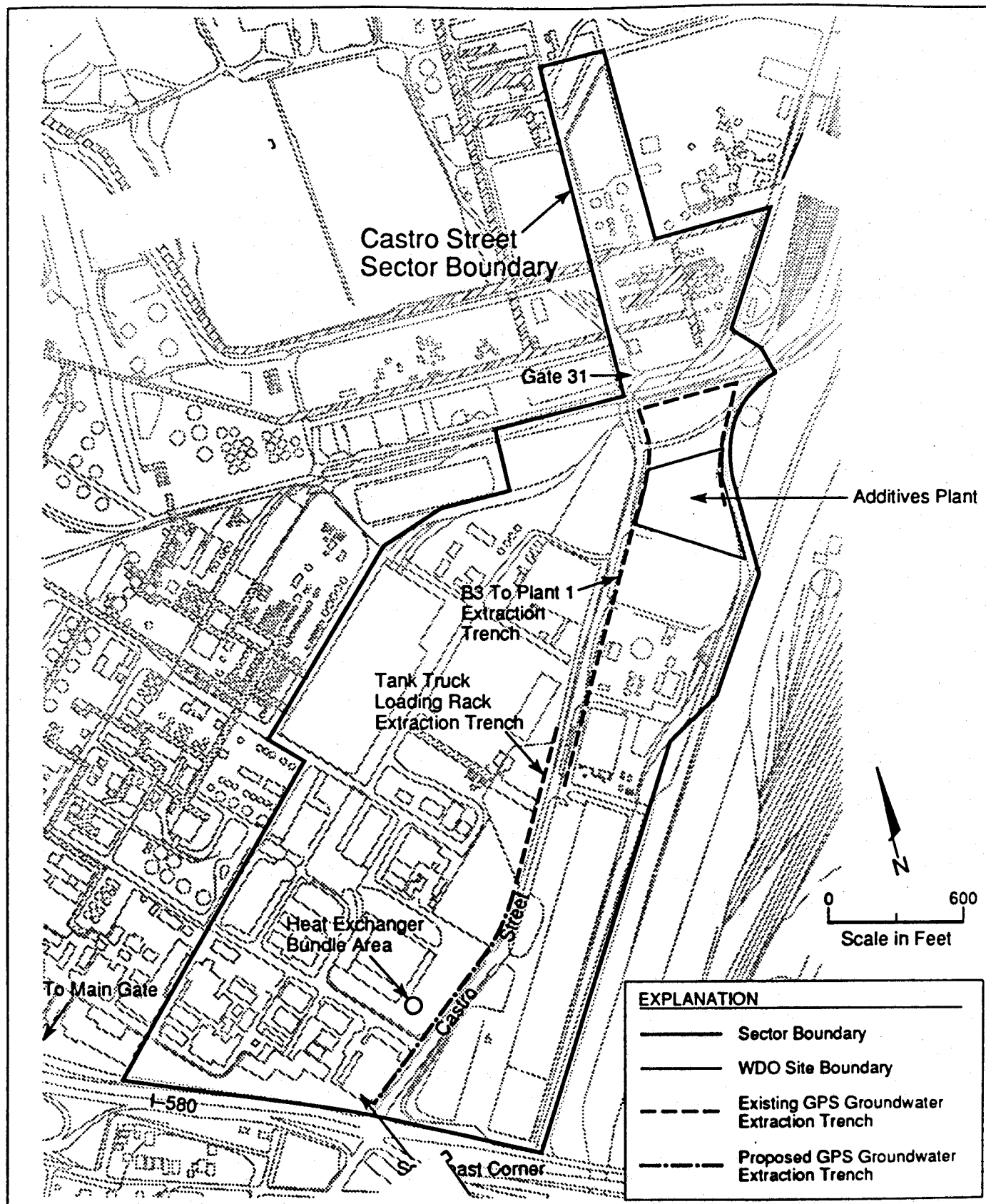
**EXPLANATION**

- Sector Boundary
- WDO Site Boundary
- - - Existing GPS Groundwater Extraction Trench
- . - . Proposed GPS Groundwater Slurry Wall



**LANDFARM/LANDFILL SECTOR**  
 Richmond Refinery, California  
 Waste Discharge Requirements

Figure 4a Landfarms/Landfills Sector Boundary Map



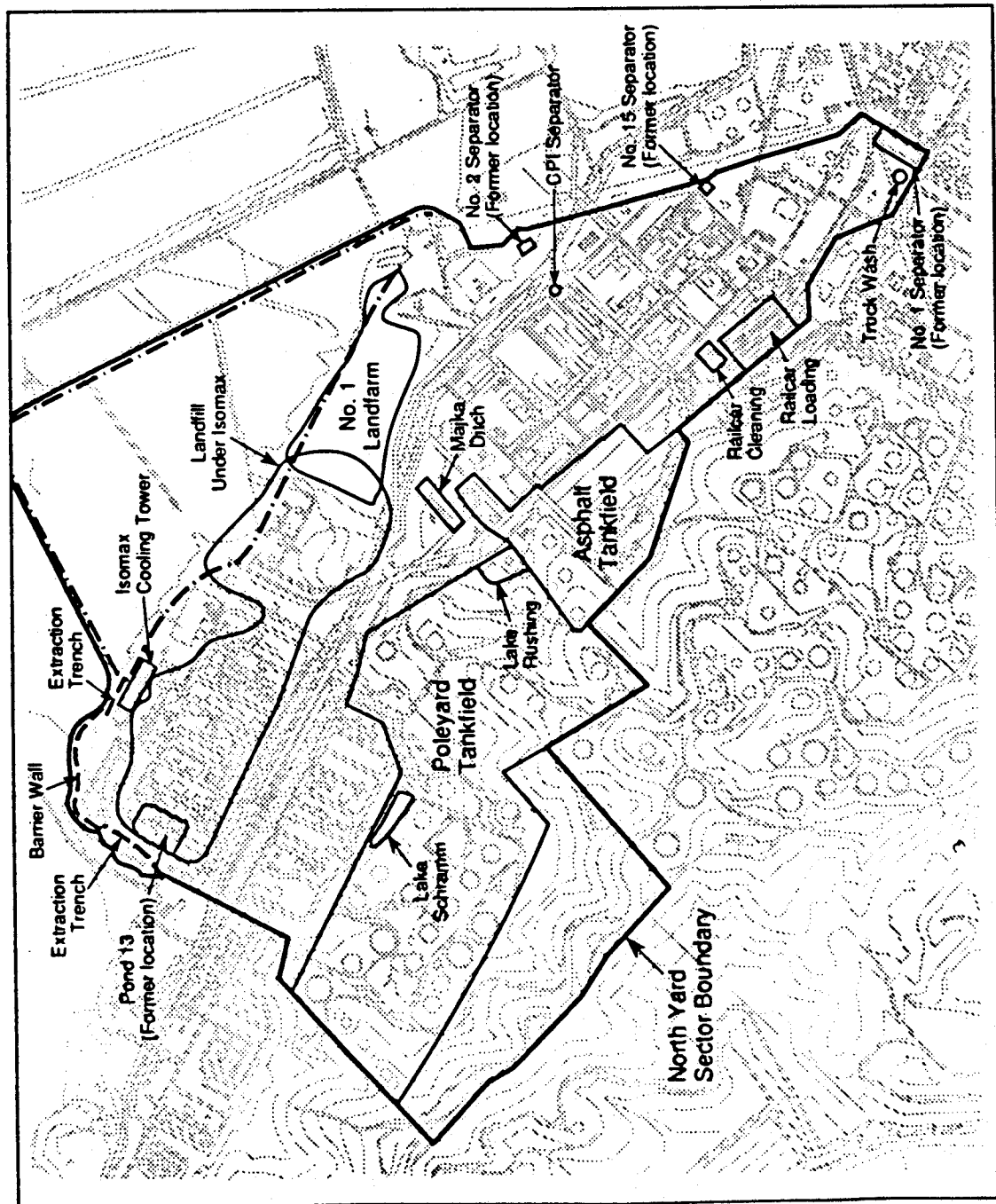
# **CASTRO STREET SECTOR** Richmond Refinery, California Waste Discharge Requirements

Figure 4b Castro Sector Boundary Map



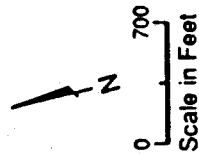
**MAIN YARD SECTOR**  
Richmond Refinery, California  
Waste Discharge Requirements

Figure 4c Main Yard Sector Boundary Map



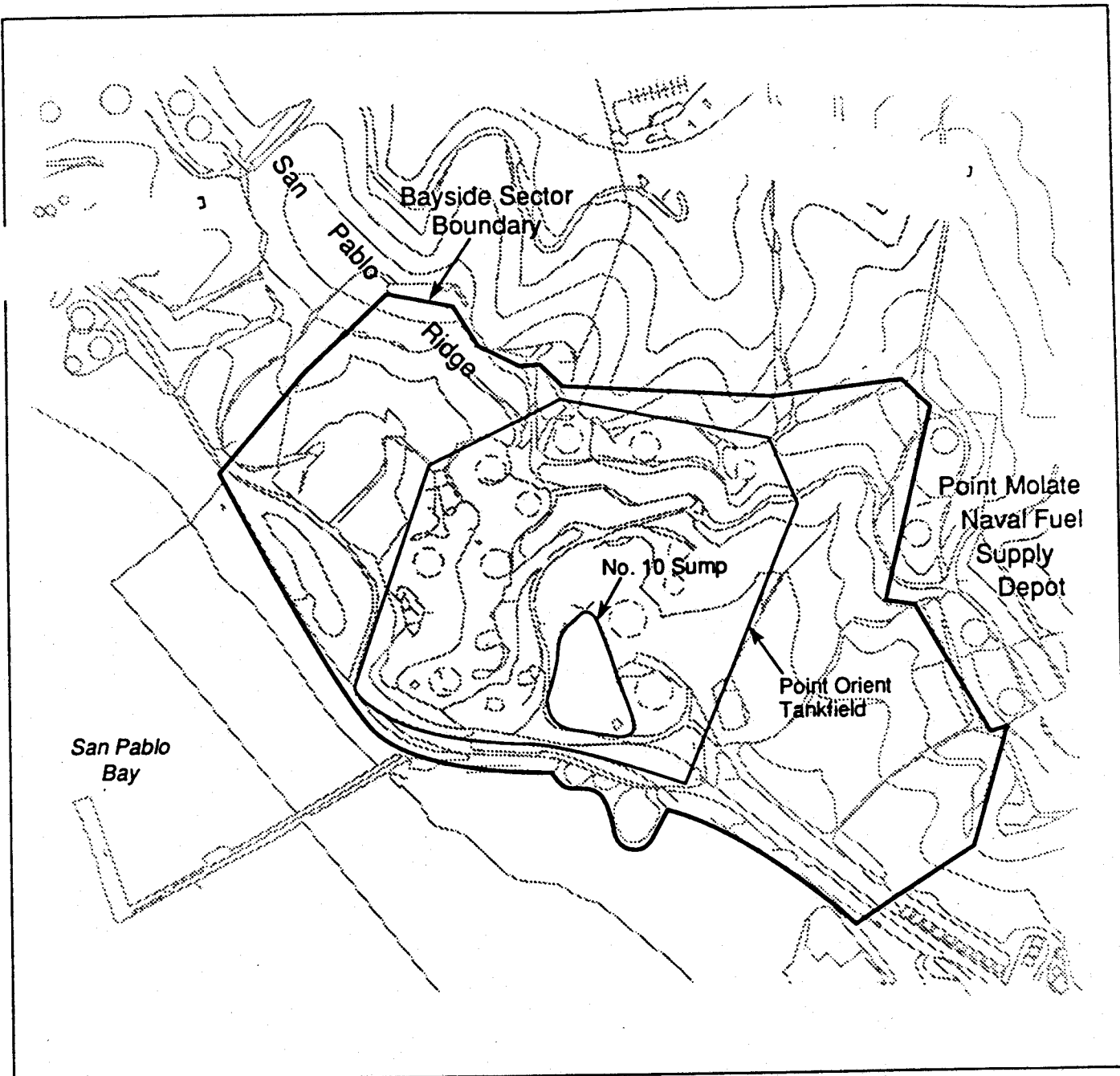
# EXPLANATION

- Sector Boundary
- WDO Site Boundary
- - - Existing GPS Groundwater Extraction Trench or Slurry Wall
- · - · - Proposed GPS Groundwater Extraction Trench and/or Slurry Wall



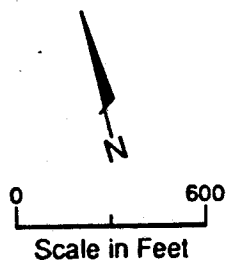
## **NORTH YARD SECTOR** Richmond Refinery, California Waste Discharge Requirements

Figure 4d North Yard Sector Boundary Map



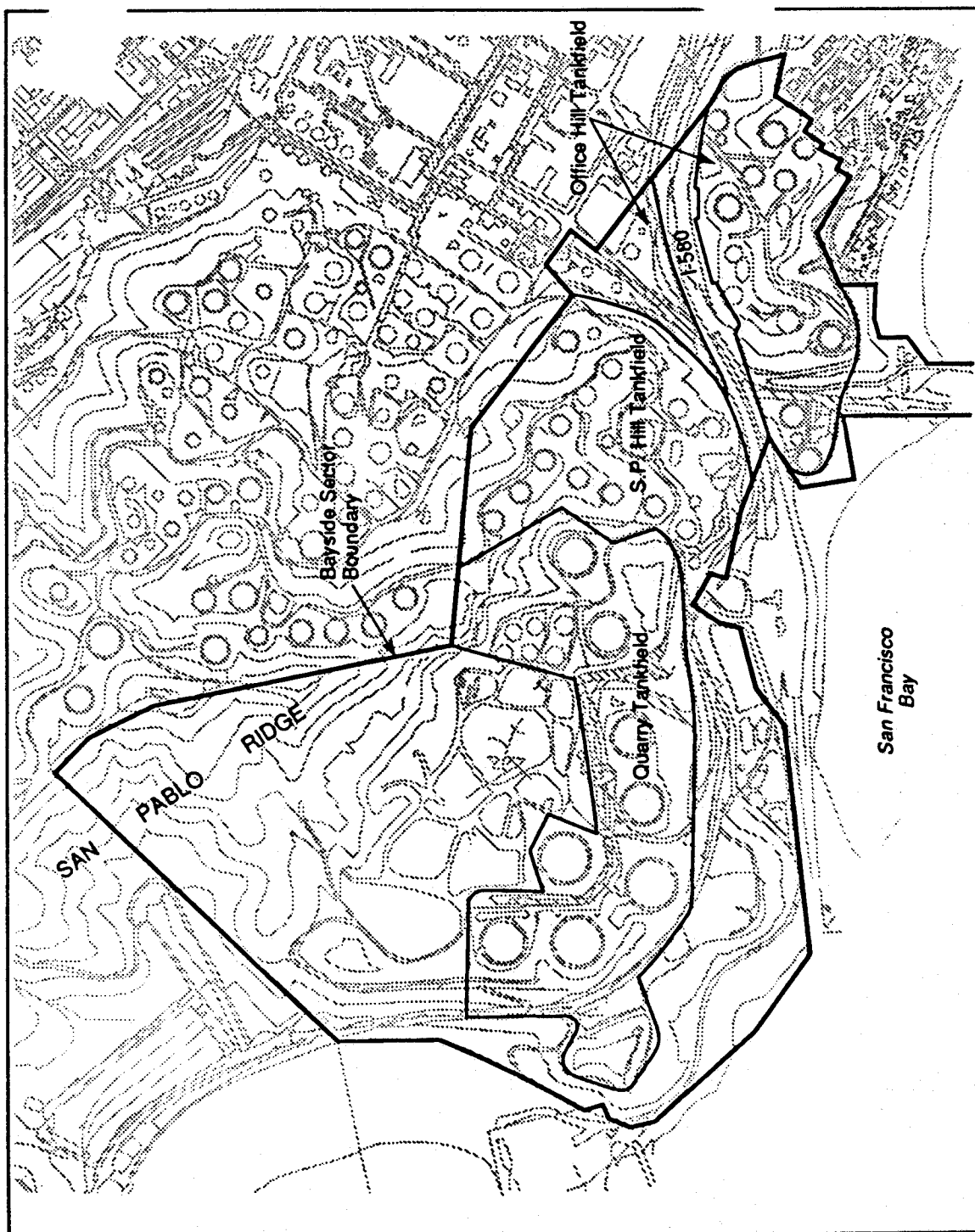
**EXPLANATION**

- Sector Boundary
- - - WDO Site Boundary



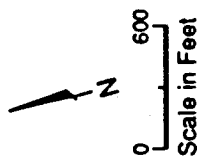
**BAYSIDE SECTOR**  
Richmond Refinery, California  
Waste Discharge Requirements

Figure 4e Bayside Sector Boundary Map - North



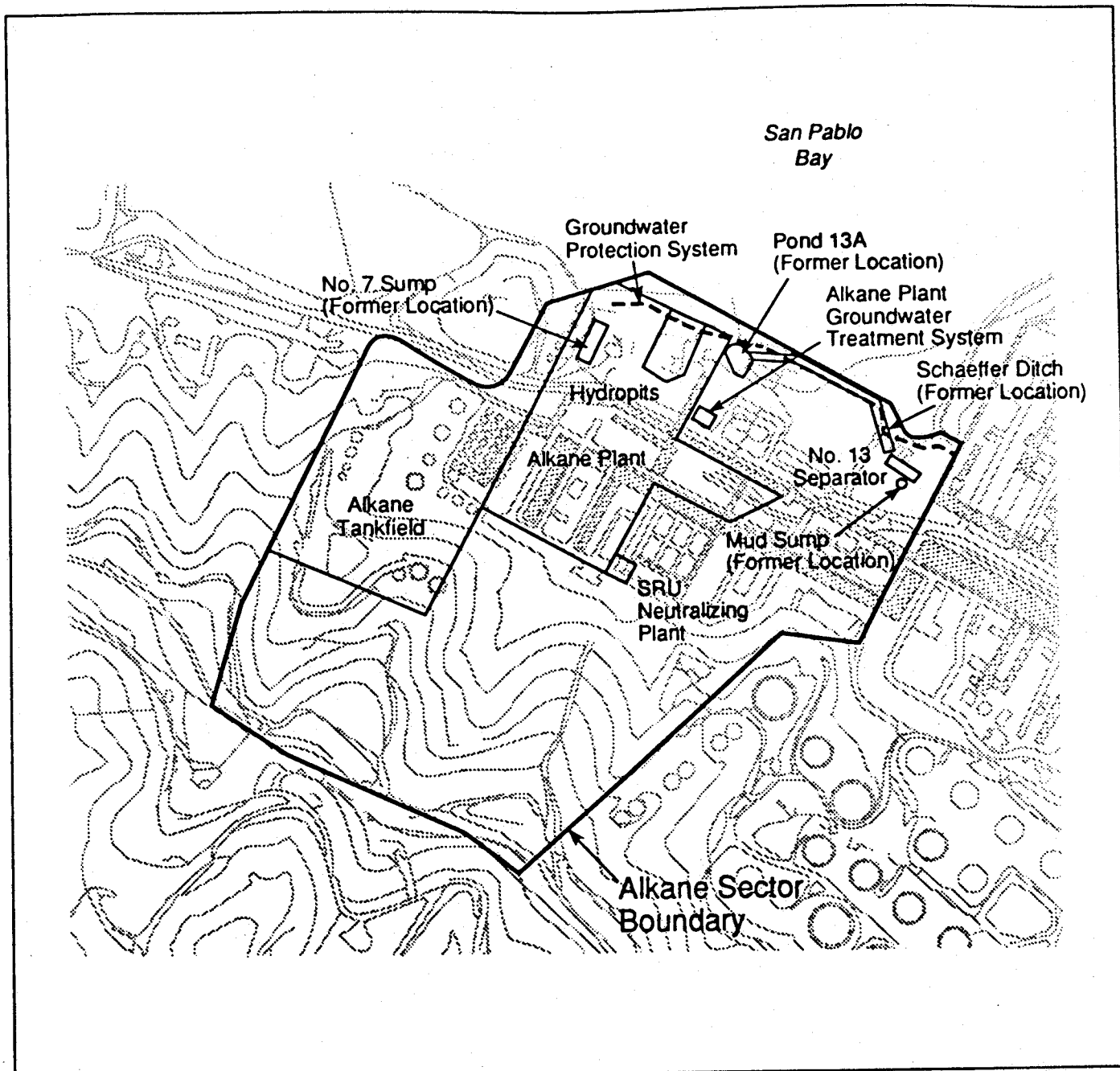
**EXPLANATION**

- Sector Boundary
- WDO Site Boundary



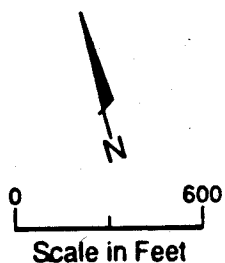
**BAYSIDE SECTOR**  
 Richmond Refinery, California  
 Waste Discharge Requirements

Figure 4f Bayside Sector Boundary Map - South



#### EXPLANATION

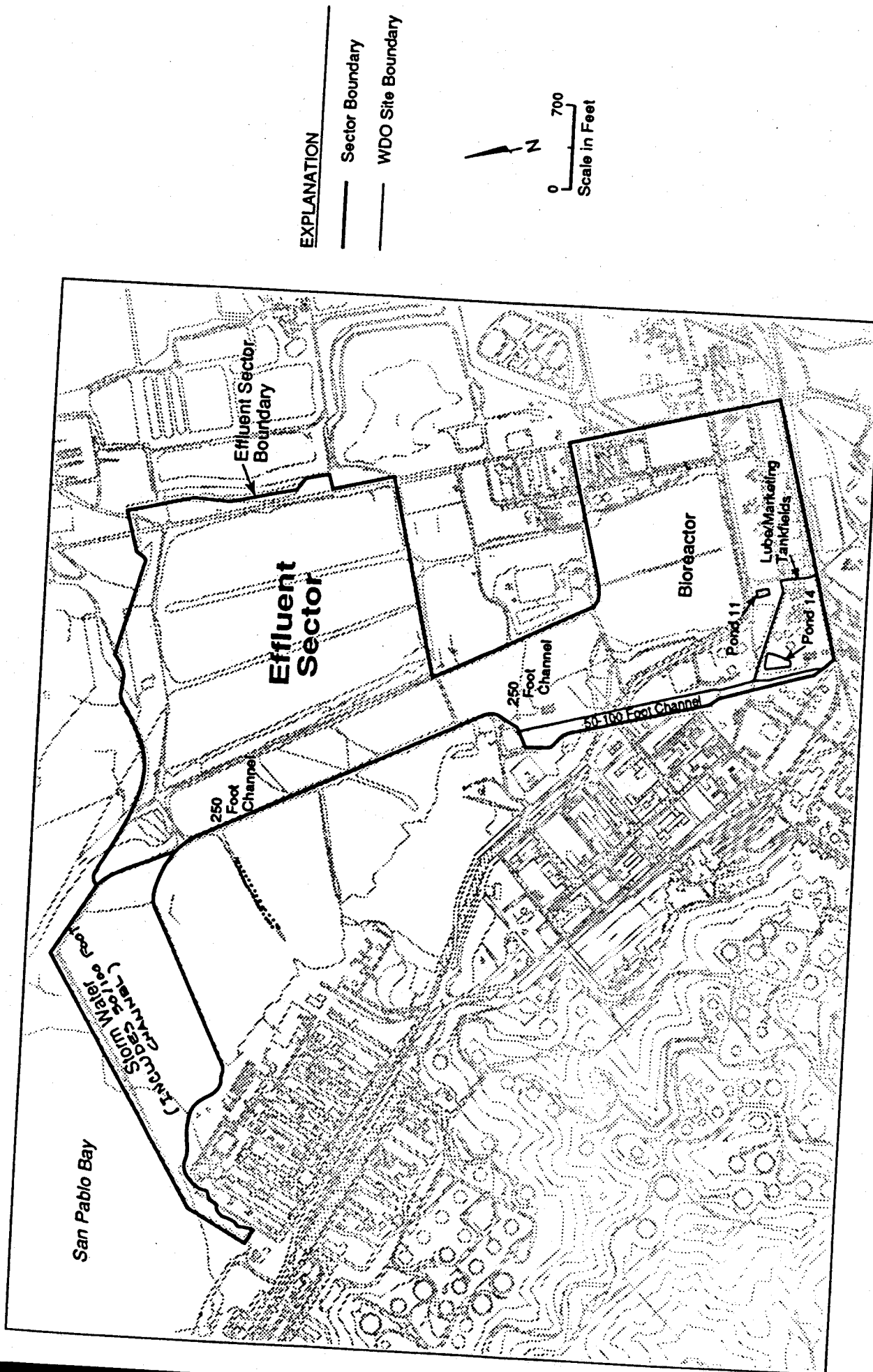
- Sector Boundary
- WDO Site Boundary
- - - - Existing GPS Groundwater Extraction Trench and/or Slurry Wall



**ALKANE SECTOR**  
 Richmond Refinery, California  
 Waste Discharge Requirements

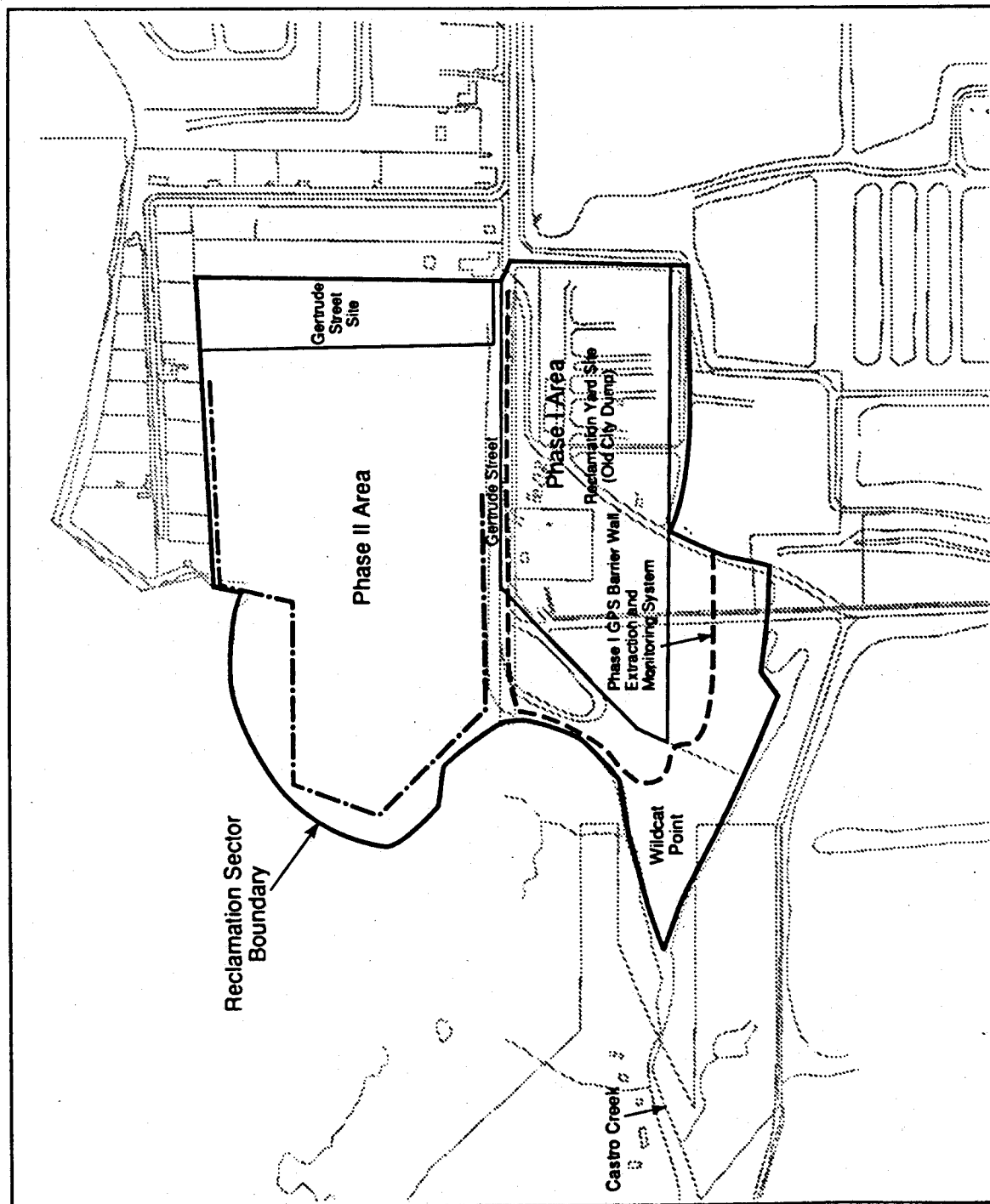
Figure 4g Alkane Sector Boundary Map





# **EFFLUENT SECTOR** Richmond Refinery, California Waste Discharge Requirements

Figure 4h Effluent Sector Boundary Map

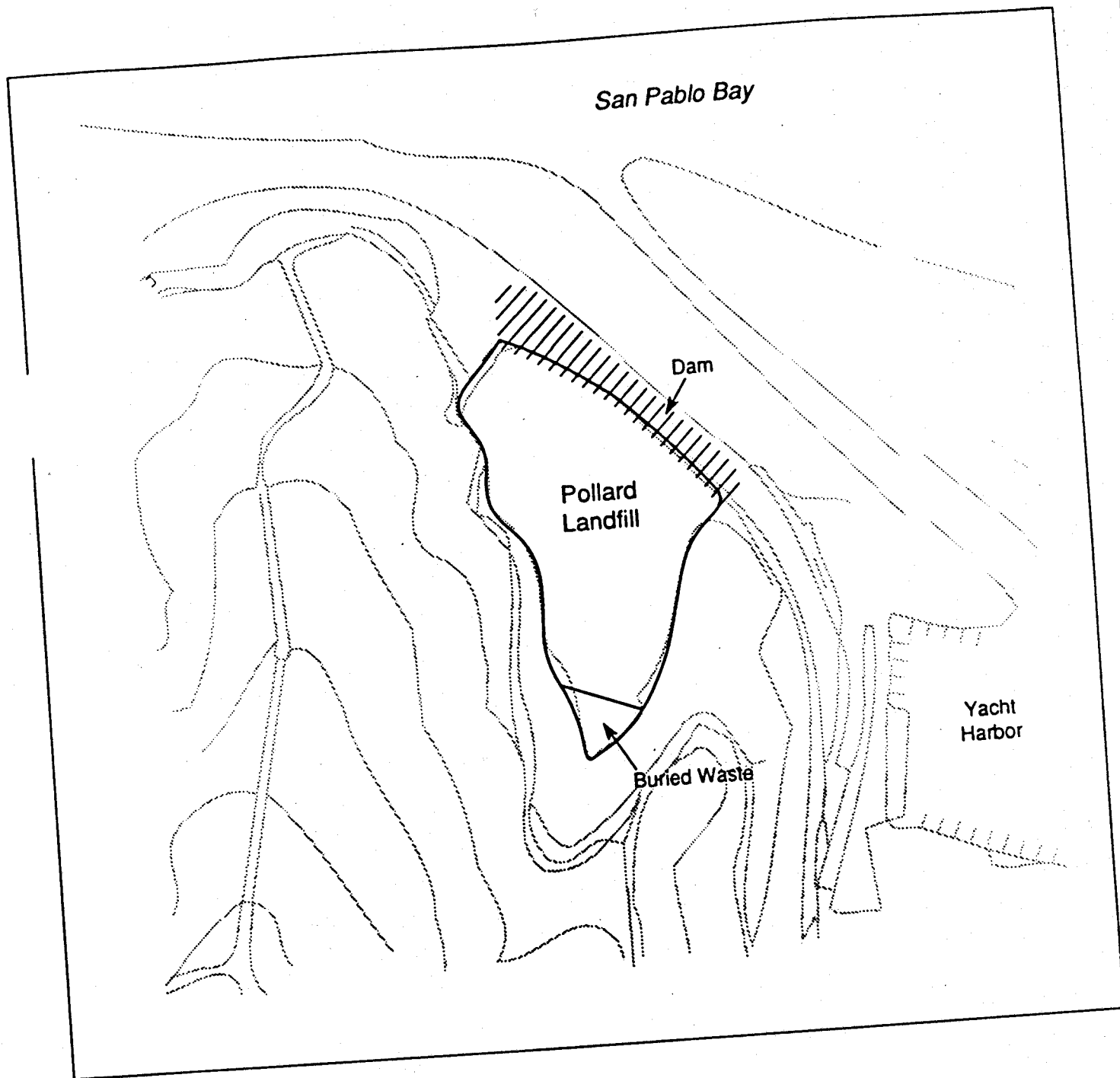


# EXPLANATION

- Sector Boundary
- WDO Site Boundary
- - - Existing GPS Groundwater Extraction Wells and Slurry Wall
- · - · - Proposed GPS Groundwater Extraction Wells and Slurry Wall

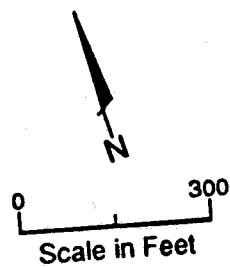
## RECLAMATION SECTOR Richmond Refinery, California Waste Discharge Requirements

Figure 4i Reclamation Sector Boundary Map



**EXPLANATION**

- WDO Site Boundary
- //// Dam Area



**POLLARD**  
Richmond Refinery, California  
Waste Discharge Requirements

Figure 5 Pollard Pond Landfill Site Map

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION**

**MONITORING AND REPORTING PROGRAM**

**FOR**

**CHEVRON U.S.A., RICHMOND FACILITY  
CONTRA COSTA COUNTY**

**ORDER NO. 93-109**

**CONSISTS OF**

**PARTS I, II, and III**

## PART I

### A. GENERAL

Reporting responsibilities of waste dischargers are specified in Sections 13225(a), 13267(b), 13383, and 13387(b) of the California Water Code and this Regional Board's Resolution No.73-16. This Monitoring and Reporting Program (M&RP), is issued in accordance with Provision C.19 of Regional Board Order No. 93-109.

The principal purposes of a M&RP are: (1) to document compliance with waste discharge requirements and prohibitions established by the Board, (2) to facilitate the prevention and abatement of pollution arising from waste discharge, (3) to develop or assist in the development of standards of performance, and toxicity standards, and (4) to assist the discharger in complying with the requirements of Article 5, Chapter 15.

This groundwater monitoring program is sub-divided into two groups; those subject to Article 5 and those that are not; i.e. those which do not contain waste management units. The group subject to Article 5 consists of the Groundwater Protection System (GPS), Pollard, and the Effluent corrective action programs. The GPS corrective action monitoring has been sub-divided into sector-specific curricula. The group not subject to Article 5 requirements consists of the Bayside North, the Bayside South and the Interior "C" Zone wells.

### B. SAMPLING AND ANALYTICAL METHODS

Sample collection, storage, and analysis shall be performed according to the most recent version of Standard USEPA Methods, and in accordance with an approved sampling and analysis plan. Water and waste analysis shall be performed by a laboratory approved for these analyses by the State of California. Specific methods of analysis must be identified. If methods other than USEPA-approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the Executive Officer prior to use. The director of the laboratory, or the director's designee, shall supervise all analytical work in his/her laboratory and shall sign the lab reports submitted to the Regional Board. All monitoring instruments and equipment shall be properly calibrated and maintained to ensure accuracy of measurements. In addition, the discharger is responsible for seeing that the laboratory analysis of all samples from Monitoring Points and Background Monitoring Points meets the following restrictions:

1. The methods of analysis and the detection limits used must be appropriate for the expected concentrations. For detection monitoring of any constituent or parameter that is found in concentrations which produce more than 90% non-numerical determinations [i.e., "trace" or "ND"] in data from Background Monitoring Points for that medium, the analytical method having the lowest method detection limit [MDL] -- defined in Part I.C.7. -- shall be selected from among those methods which would provide valid results in light of any "Matrix Effects" [defined in Part I.C.6.] involved.
2. MDLs and PQLs shall be derived by the laboratory for each analytical procedure, according to State of California laboratory accreditation procedures. These MDLs and PQLs shall reflect the detection and quantitation capabilities of the specific analytical procedure and equipment used by the lab, rather than simply being quoted from USEPA analytical method manuals. If the lab suspects that, due to a change in matrix

or other effects, the true detection limit or quantitation limit for a particular analytical run differs significantly from the laboratory-derived MDL/PQL values, the results shall be flagged accordingly, along with an estimate of the detection limit and quantitation limit actually achieved.

3. All QA/QC data shall be reported, along with the sample results to which it applies, including the analytical method, equipment, practical quantitation limits, recovery rates, relative percent difference and the results of equipment and method blanks, matrix spiked samples, the frequency of quality control analysis, matrix background samples and lab control samples. In addition, analysis results for method blanks or spike recovery shall be reported unadjusted.
4. Statistical procedures for determining the significance of analytical results need not be performed for common laboratory contaminants (i.e., methylene chloride, acetone, diethylhexyl phthalate, and di-n-octyl phthalate). Nevertheless, analytical results involving detection of these analytes in any background or downgradient sample shall be reported and flagged for easy reference by Board staff.
5. In cases where contaminants are detected in QA/QC samples [i.e., field, trip, or lab blanks], the accompanying sample results shall be appropriately reported.
6. The MDL shall always be calculated such that it represents a concentration associated with a 99% reliability of a non-zero result.

#### C. DEFINITION OF TERMS

1. The "Monitored Media" are those water bearing media that are monitored pursuant to this Monitoring and Reporting Program. The Monitored Media at this facility is the ground water in the uppermost aquifer, in any other portion of the zone of saturation [§2601 of Chapter 15] in which it would be reasonable to anticipate that waste constituents migrating from the facility could be detected, and in any perched zones underlying the facility.
2. The "Constituents of Concern [COC]" are those constituents which are likely to be in the waste in the facility or which are likely to be derived from waste constituents, in the event of a release. The Constituents of Concern for this facility are listed in Appendix I.
3. The "Monitoring Parameters" are a subset of the constituents of concern and are parameters used for the majority of monitoring activity. The Monitoring Parameters for the facility are listed in Appendix I. Monitoring Parameters are used to indicate the condition of the monitored media to determine whether the monitored media has been impacted by a significant release or whether a clean-up goal has been achieved. For a detection monitoring program, the monitoring parameters provide a possible indication of a release. During a corrective action period, monitoring parameters provide a means to evaluate the effectiveness of the corrective action.
4. "Standard Observations" refer to:
  - a) Evidence of erosion;
  - b) Physical condition of monitoring point; and
  - c) Evidence of ponded water directly adjacent to a monitoring point.

5. **"Standard Analysis and Measurements"** refers to:
  - a) Turbidity [only for water samples], in NTU;
  - b) Water elevation to the nearest 1/100th foot above mean sea level [only for ground water monitoring]; and
  - c) Sampling and statistical/non-statistical analysis of the **Monitoring Parameters**.
6. **"Matrix Effect"** refers to any increase in the Method Detection Limit or Practical Quantitation Limit for a given constituent as a result of the presence of other constituents – either of natural origin or introduced through a release – that are present in the sample of water.
7. **"Method Detection Limit [MDL]"**, for a given analytical laboratory using a given analytical method to detect a given constituent [in spite of any Matrix Effect] means the lowest concentration at which the laboratory can regularly differentiate – with 99% reliability – between a sample which contains the constituent and one which does not.
8. **"Practical Quantitation Limit [PQL]"**, for a given analytical laboratory using a given analytical method to determine the concentration of a given constituent [in spite of any Matrix Effect] means the lowest constituent concentration the laboratory can regularly quantify within specified limits of precision that are acceptable to the Regional Board Executive Officer.
9. **"Sample & Analysis Period"** means the duration separating sampling and analysis events from monitoring points or wells, for a given type of monitoring from the time the next iteration of that event. Unless otherwise specified in this M&RP, the period for sampling and analysis for the Monitoring Parameters is 3 months; [1st Quarter = January 1 to March 31; 2nd Quarter = April 1 to June 30; 3rd Quarter = July 1 to September 30; and 4th Quarter = October 1 to December 31]. The period for sampling and analysis of all Constituents of Concern (COC), is every 2 years for the first five years from the date of issuance of this M&RP, and then once every five years after the fifth Annual Report unless the Executive Officer requests to continue the once-per-2year COC Sampling and Analysis Event, (i.e. once in 1994, 1996, 1998 and then every five years).
10. **"Sample & Analysis Event"** means the point in time that sampling and analysis is performed from monitoring points or wells, for a given type of monitoring. The sampling and analysis event will be during the 1st Quarter of the Sampling and Analysis Period.
11. **"Reporting Period"** means the duration separating the submittal of a monitoring report from the time the next iteration of that report is scheduled for submittal. Unless otherwise specified in this M&RP, the reporting period of the results of the sampling and analysis period is 6 months; [1st & 2nd Quarters = January 1 to June 30; and 3rd & 4th Quarter = July 1 to December 31]. The Reporting Period for the Annual Summary Report extends from January 1 of the previous year to December 31 of the current year. The due date for any given report will be 60 days after the end of its Reporting Period, unless otherwise stated.
12. **"Receiving Waters"** refers to any surface water which actually or potentially receives surface or ground waters which pass over, through, or under waste materials or

contaminated soils. In this case the following surface water bodies are considered receiving waters: San Pablo Bay, San Francisco Bay, Wildcat Creek and Castro Creek.

**D. RECORDS TO BE MAINTAINED**

Written reports shall be maintained by the discharger or laboratory, and shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge or when requested by the Board. Such records shall show the following for each sample:

1. Identity of sample and of the Monitoring Point or Background Monitoring Point from which it was taken, along with the identity of the individual who obtained the sample;
2. Date and time of sampling;
3. Date and time that analyses were started and completed, and the name of the personnel performing each analysis;
4. Complete procedure used, including method of preserving the sample, and the identity of reagents used;
5. Calculation of results; and
6. Results of analyses, and the MDL and PQL for each analysis.

**E. REPORTS TO BE FILED WITH THE BOARD**

1. A written **Semi-Annual Monitoring Report** shall be submitted once annually. The second Semi-Annual Report will be the "**Annual Summary Report**". The reports shall be comprised of at least the following:

**a. Letter of Transmittal**

A letter transmitting the essential points in each report shall accompany each report. Such a letter shall include a discussion of any requirement violations found since the last such report was submitted, and shall describe actions taken or planned for correcting those violations. If the discharger has previously submitted a detailed time schedule for correcting said requirement violations, a reference to the correspondence transmitting such schedule will be satisfactory. If no violations have occurred since the last submittal, this shall be stated in the letter of transmittal. Monitoring reports and the letter transmitting the monitoring reports shall be signed by a principal executive officer at the level of vice president or above, or by his/her duly authorized representative. The letter shall contain a statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true, complete, and correct;

- b. The First Monitoring Report shall include a sampling protocol summary. The summary shall contain at least:**
  - 1) For each monitored ground water body, a description and graphical presentation of the velocity and direction of ground water flow under/around the facility, based upon water level elevations taken semi-annually during the 2nd and 4th quarter monitoring events;



- 2) **Pre-Sampling Purge for Samples Obtained From Wells:** For each monitoring well addressed by the report, a description of the method and time of water level measurement, of the type of pump used for purging and the placement of the pump in the well, and of the method of purging (the pumping rate, the equipment and methods used to monitor field pH, temperature, and conductivity during purging, the calibration of the field equipment, results of the pH, temperature, conductivity, and turbidity testing, the well recovery time, and the method of disposing of the purge water);
  - 3) **Sampling:** For each Monitoring Point and Background Monitoring Point addressed by the report, a description of the type of pump – or other device – used and its placement for sampling, and a detailed description of the sampling procedure [number and description of the samples, field blanks, travel blanks, and duplicate samples taken, the type of containers and preservatives used, the date and time of sampling, the name and qualifications of the person actually taking the samples, and any other observations];
  - 4) **Post-Sampling Purge [§2550(e)(12)(B)]:** For each monitoring well addressed by the report, a description of how the well was purged to remove all portions of the water that was in the well bore while the sample was being taken;
  - 5) Variations from the above protocol shall be included in subsequent reports.
- c. A map or aerial photograph showing the locations of Monitoring Points;
  - d. For each Monitoring Report include laboratory statements of results of all analyses demonstrating compliance with Part I.B.;
  - e. An evaluation of the effectiveness of the leachate monitoring and control facilities, if present, and of the run-off/run-on control facilities;

## 2. **CONTINGENCY REPORTING**

- a. The discharger shall report by telephone, immediately after it is discovered, evidence of a significant release that may pose an imminent threat to surface or subsurface waters of the State from any classified waste management unit or beyond any boundary of the refinery. A written report shall be filed with the Board within seven days, containing at least the following information:
  - 1) A map showing the location(s) of release;
  - 2) An estimate of the flow rate;
  - 3) A description of the nature of the discharge (e.g., all pertinent observations and analyses); and
  - 4) Additional corrective measures underway or proposed.
- b. Should the initial statistical comparison [Part III.A] or non-statistical comparison [Part III.B] indicate, for any Constituent of Concern or Monitoring Parameter, that a statistically significant release is tentatively identified, the discharger shall immediately notify the Regional Board verbally as to the Monitoring Point(s) and constituent(s) or parameter(s) involved, shall provide written notification by certified mail within seven days of such determination [§2550.8(j)(1)], and shall carry out a discrete retest in accordance with Parts III.C. If the retest confirms the existence of a significant release,

the discharger shall carry out the requirements of Part I.E.2.d. In any case, the discharger shall inform the Regional Board of the outcome of the retest as soon as the results are available, following up with written results submitted by certified mail within seven days of completing the retest.

- c. If either the discharger or the Regional Board determines that there is significant physical evidence of a release [§2550.1(3) of Article 5], the discharger shall immediately notify the Regional Board of this fact by certified mail [or acknowledge the Regional Board's determination] and shall carry out the requirements of Part I.E.2.d. for all potentially-affected monitored media.
- d. If the discharger concludes that a release, or a statistically significant increase in contaminant concentration, has occurred:
  - 1) Then the discharger shall, within thirty days, sample for all Constituents of Concern at all Monitoring Points in the immediate vicinity of the observed release or increased concentration and submit them for laboratory analysis. Within seven days of receiving the laboratory analytical results, the discharger shall notify the Regional Board, by certified mail, of the concentration of all Constituents of Concern at each resampled Monitoring Point. Because this scan is not to be tested against background, only a single datum is required for each Constituent of Concern at each sampled Monitoring Point [§2550.8(k)(1)];
  - 2) The discharger shall, within 180 days of concluding that a significant release has occurred, submit a preliminary engineering feasibility study meeting the requirements of §2550.8(k)(6) of Article 5 to provide for a corrective action proposal or for the improvement of the performance of any existing corrective action.

### 3. ANNUAL SUMMERY REPORT

The discharger shall submit an annual report to the Board covering the previous monitoring year. The Reporting Period ends December 31. This report shall contain:

- a. A Graphical Presentation of Analytical Data [§2550.7(e)(14) of Article 5]. For each Monitoring Point and any Background Monitoring Points, submit in graphical format the laboratory analytical data for all monitoring parameters and for constituents of concern taken within at least the previous five calendar years, if available. Each such graph shall plot the concentration of one or more constituents over time for a given Monitoring Point or Background Monitoring Point, at a scale appropriate to show trends or variations in water quality. The graphs shall plot each measured value, rather than plotting mean values. For any given constituent or parameter, the scale for background plots shall be the same as that used to plot downgradient data. On the basis of any aberrations noted in the plotted data, the Executive Officer may direct the discharger to carry out a preliminary investigation [§2510(d)(2)], the results of which will determine whether or not a release is indicated;
- b. All monitoring analytical data obtained during the previous two six-month Reporting Periods, presented in tabular form as well as on a 3½" or 5¼" diskettes, either in MS-DOS/ASCII format or in another file format acceptable to the Executive Officer. Data sets too large to fit on a single 360KB/720KB or 1.2MB/1.4MB diskette may be submitted on disk in a commonly available compressed format [e.g., FASTBACK or NORTON BACKUP, etc.]. The Board regards the submittal of data in hard copy and on diskette

as "...the form necessary for..." statistical analysis [§2550.8(h)], in that this facilitates periodic review by the Board's statistical consultant;

- c. A comprehensive discussion of the compliance record, and the result of any corrective actions taken or planned which may be needed to bring the discharger into full compliance with the waste discharge requirements;
- d. A written summary of the ground water and soil-pore gas analyses, indicating any changes made since the previous annual report; and
- e. An evaluation of the effectiveness of the leachate monitoring/control facilities, where applicable, pursuant to §2543(b,c, & d).

## **Part II: MONITORING AND OBSERVATION SCHEDULE**

### **WATER SAMPLING/ANALYSIS FOR MONITORING**

1. **Thirty-Day Sample Procurement Limitation.** For any given monitored medium and relative to its respective sector, the samples taken from all Monitoring Points and Background Monitoring Points to satisfy the data analysis requirements for a given Reporting Period, shall all be taken within a span not exceeding 30 days, and shall be taken in a manner that insures sample independence to the greatest extent feasible [§2550.7(e)(12)(B) of Article 5]. Ground water sampling shall also include an accurate determination of the ground water surface elevation and field parameters [temperature, electrical conductivity, turbidity] for that Monitoring Point or Background Monitoring Point [§2550.7(e)(13)]. Statistical or non-statistical analysis shall be carried out as soon as the data is available, in accordance with Part III of this program.
2. **Monitoring Points and Background Monitoring Points For Each Monitored Medium:** The discharger shall sample the Monitoring Points in accordance with this M&RP taking enough samples to qualify for the most appropriate test under Part III for groundwater in the A-Zone and C-Zone: The Monitoring Points are listed in Appendix II.
3. **Monitoring Schedule:** The discharger shall sample and analyze groundwater from each monitoring point listed in Appendix II during the 1st quarter of every other year for each COC and during the 1st and 3rd quarter, annually for each Monitoring Parameter, (see Appendix I).
4. **Determination of Ground Water Flow Rate/Direction [§2550.7(e)(15) of Article 5]:** The discharger shall measure the water level in each GPS Corrective Action monitoring well and determine ground water flow rate and direction in each ground water body described in Part II.2. at least quarterly, including the times of expected highest and lowest elevations of the water level for the respective ground water body.
5. **Refinery-wide "A" and "C" Zone Water Level Measurements:** The discharger shall determine groundwater flow directions for the "A" and "C" Zone water bearing zones on a semi-annual basis to assess whether significant change in flow direction has occurred.

### **Part III: STATISTICAL AND NON-STATISTICAL ANALYSIS OF SAMPLE DATA DURING A DETECTION MONITORING PROGRAM**

The discharger has the option of using a statistical or non-statistical method to determine if a release has occurred in this monitoring program. One of the non-statistical method options is a direct comparison of the detected concentrations at a monitoring point with the maximum allowable concentration limits included in Appendix I. If a maximum allowable concentration limit is exceeded, the discharger has the additional option of performing one of the statistical or non-statistical methods included in this section or in Article 5, or the discharger can propose an statistical analysis acceptable to the Executive Officer. The following is a description of recommended options available to the discharger.

- A. **Statistical Methods.** The discharger may use one of the following statistical methods to analyze Constituents of Concern or Monitoring Parameters which exhibit concentrations exceeding their respective Maximum Allowable Concentration Limits (MACL). Except for pH, which uses a two-tailed approach, the statistical analysis for all constituents and parameters shall be one-tailed [testing only for statistically significant increase relative to background]:
1. **One-Way Parametric Analysis of Variance (ANOVA), followed by multiple comparisons** [§2550.7(e)(8)(A)]. This method requires at least four independent samples from each Monitoring Point and Background Monitoring Point during each sampling episode. It shall be used when the pooled background data for the parameter or constituent, obtained during a given sampling period, has not more than 15% of the data below the PQL. Prior to analysis, replace all "trace" determinations with a value halfway between the PQL and the MDL values reported for that sample run, and replace all "non-detect" determinations with a value equal to half the MDL value reported for that sample run. The ANOVA shall be carried out at the 95% confidence level. Following the ANOVA, the data from each downgradient Monitoring Point shall be tested at a 99% confidence level against the pooled background data. If these multiple comparisons cause the Null Hypothesis [i.e., that there is no release] to be rejected at any Monitoring Point, the discharger shall conclude that a release is tentatively indicated for that parameter or constituent;
  2. **One-Way Non-Parametric ANOVA (Kruskal-Wallis Test), followed by multiple comparisons.** This method requires at least nine independent samples from each Monitoring Point and Background Monitoring Point; therefore, the discharger shall anticipate the need for taking more than four samples per Monitoring Point, based upon past monitoring results. This method shall be used when the pooled background data for the parameter or constituent, obtained within a given sampling period, has not more than 50% of the data below the PQL. The ANOVA shall be carried out at the 95% confidence level. Following the ANOVA, the data from each downgradient Monitoring Point shall be tested at a 99% confidence level against the pooled background data. If these multiple comparisons cause the Null Hypothesis (i.e., that there is no release) to be rejected at any Monitoring Point, the discharger shall conclude that a release is tentatively indicated for that parameter or constituent; or
  3. **Method of Proportions.** This method may be used if the "combined data set" -- the data from a given Monitoring Point in combination with the data from the Background Monitoring Points -- has between 50% and 90% of the data below the MDL for the

constituent or parameter in question. This method (1) requires at least nine downgradient data points per Monitoring Point per Reporting Period, (2) requires at least thirty data points in the combined data set, and (3) requires that  $n * P > 5$  [where n is the number of data points in the combined data set and P is the proportion of the combined set that exceeds the MDL]; therefore, the discharger shall anticipate the number of samples required, based upon past monitoring results. The test shall be carried out at the 99% confidence level. If the analysis results in rejection of the Null Hypothesis [i.e., that there is no release], the discharger shall conclude that a release is tentatively indicated for that constituent or parameter, or

- B. **Non-Statistical Method.** The discharger may use the following non-statistical method for the Monitoring Parameters and for all Constituents of Concern which are not amenable to the statistical tests under Part III.A. The first step of the test involves building a list of "qualifying constituents" for each Monitoring Point, as explained below for each variant of the test; the list is then inspected to see if it meets either of two possible triggering conditions. Each qualifying constituent at a Monitoring Point shall be determined based on either (A) the data from a single sample for that constituent, taken during that Reporting Period from that Monitoring Point, or (B) [where several independent samples have been analyzed for that constituent at a given Monitoring Point] from the sample which contains the largest number of qualifying constituents. Background Monitoring Points shall be represented by the data from all samples taken from them during that Reporting Period [at least one sample from each Background Monitoring Point]. The method shall be implemented as follows:
1. **For the Volatile Organics Monitoring Parameter For Water Samples [VOC<sub>water</sub>]:** For any given Monitoring Point, the VOC<sub>water</sub> Monitoring Parameter is a composite parameter addressing all VOCs detectable using USEPA Method 601/602. The test involves compiling a list of "qualifying constituents" consisting of each VOC [including any unidentified peaks] which (A) exceeds its MDL in the Monitoring Point sample, **and also** (B) exceeds its MDL in less than ten percent of the samples taken from Background Monitoring Points. The discharger shall conclude that a release is tentatively indicated for the VOC<sub>water</sub> Monitoring Parameter if the list contains **either** (A) two or more qualifying constituents, **or** (B) one qualifying constituent that exceeds its PQL;
  2. **For Constituents of Concern:** Compile a list of constituents that exceed their respective MDL at the Monitoring Point yet do so in less than ten percent of background samples [i.e., "qualifying constituents"]. The discharger shall conclude that a release is tentatively indicated if the list contains **either** (A) two or more qualifying constituents, **or** (B) one qualifying constituent which exceeds its PQL.
- C. **Discrete Retest [§2550.7(e)(8)(E) of Article 5].** In the event that the discharger concludes that a release has been tentatively indicated [under Parts III.A or III.B], the discharger may be required to – within 30 days of this indication – collect two new suites of samples for the indicated Constituent(s) of Concern or Monitoring Parameter(s) at each indicating Monitoring Point, collecting at least as many samples per suite as were used for the initial test. Resampling of the Background Monitoring Points is optional. As soon as the data is available, the discharger shall rerun the statistical method [or non-statistical comparison] separately upon each suite of retest data. For any indicated Monitoring Parameter or Constituent of Concern at an affected Monitoring Point, if the test results of either [or both]

of the retest data suites confirms the original indication, the discharger shall conclude that a release has been discovered. All retests shall be carried out only for the Monitoring Point(s) for which a release is tentatively indicated, and only for the Constituent of Concern or Monitoring Parameter which triggered the indication there, as follows:

1. If an ANOVA method was used, the retest shall involve only a repeat of the multiple comparison procedure, carried out separately on each of the two new suites of samples taken from the indicating Monitoring Point;
2. If the Method of Proportions statistical test was used, the retest shall consist of a full repeat of the statistical test for the indicated constituent or parameter, using the new sample suites from the indicating Monitoring Point;

I, Steven R. Ritchie, Executive Officer, do hereby certify that the foregoing Monitoring and Reporting Program:

1. Has been developed in accordance with the procedure set forth in this regional Board's Resolution 73-16 in order to obtain data and documentation of compliance with waste discharge requirements established by this Board.
2. Is effective on January 1, 1994.
3. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger upon which revisions may be ordered by the Executive Officer or the Regional Board.

  
STEVEN R. RITCHIE *for*  
EXECUTIVE OFFICER

Date Issued: 11/29/93

Appendix I	Constituents of Concern, Monitoring Parameters and Maximum Allowable Concentrations
Appendix II	List of Monitoring Points

# APPENDIX I

Const. of Concern	Max. Allowable Concentration <small>µg/l unless otherwise noted</small>		Landfills/Landfills Sector										
			Castro Sector	North Yard Sector	Bayside Sector - North	Bayside Sector - South	Alkane Sector	Effluent Sector	Reclamation Sector	Pollard Pond Landfill	Interior C-Zone		
TPH-Gas	1 mg/l	c	X	X	X	X	X	X	X	/	/	X	
TPH-Diesel	1 mg/l	c	X	X	X	X	X	X	X	/	/	X	
Dissolved Sulfide	100	c	/					/	/	X			
Unionized Ammonia-N	160	c						/	/				
1,2 Dichlorobenzene	18 mg/l	a	/	/	/		/	/	/	/			
1,3 Dichlorobenzene	2.6 mg/l	a	/	/	/		/	/	/	/			
1,4 Dichlorobenzene	64	a	/	/	/		/	/	/	/			
Chlordane	0.5	d		/					/				
G-BHC (Lindane)	0.062	a		/					/				
Dieldrin	0.1	d		/					/				
Benzene	21	a	X	X	X	X	X	X	X	X	X	X	
Toluene	300 mg/l	a	X	X	X	X	X	X	X	X	X	X	
Chloroform	480	a						/					
Fluoride	2.4 mg/l	c					/						
Halomethanes	480	a	/					/		/			
PAH (Total)	15	d	/					/		/			
Pentachlorophenol	7.9	a	/					/		/			
Total Phenolics	50	c,d	/	/				/					
Selenium	50	b	/	/	/		/	/	/	/			
Arsenic	36	b	/	/				/	X				
Cadmium	9.3	b	/	/	/		/	/	/	/	/	/	
Chromium VI	50	b	/	/	/		/	/	/	/	/	/	
Total Soluble Lead	5.6	b	X	X	X	X	X	X	X	X		/	
Mercury	0.6	d	/					/	/				
Nickel	8.3	b	/	/	/		/	/	/	/	/	/	
Zinc	86	b	/	/	/		/	/	/	/	/	/	
pH	6.5 to 8.5	a	X	X	X	X	X	X	X	X	X	X	
Turbidity (NTU's)	N/A		X	X	X	X	X	X	X	X	X	X	
Temperature	N/A		X	X	X	X	X	X	X	X	X	X	

/ = Constituent of Concern per Sector

X = Monitoring Parameter per Sector

a = California Enclosed Bays and Estuaries Plan, Water Quality Objectives for Enclosed Bays and Estuaries for Protection of Human Health

b = California Enclosed Bays and Estuaries Plan, Water Quality Objectives for Protection of Saltwater Aquatic Life.

c = Tentative Value

d = Method Detection Limit

N/A = Not Applicable

## Appendix II

MONITORING POINTS  
CHEVRON REFINERY WIDE GROUND WATER  
MONITORING & REPORTING PROGRAM

ALKANE SECTOR	CASTRO SECTOR	LANDFARMS/LANDFILL 15 SECTOR	NORTHYARD SECTOR	RECLAMATION SECTOR	POLLARD SECTOR	EFFLUENT SECTOR	BAYSIDE SECTOR - NORTH	BAYSIDE SECTOR - SOUTH	INTERIOR C-ZONE
209A 460A 223C 375C 110C	323A 553A 554A 556A 106C 125C 320C	232A 233A 234A 240A 244A 384A 551A 552A GPS-4A 186C 104C 232C 234C 235C 236C	178A 247A 248A 249A 250A 550A GPS-9A 377C 178C	290A 373A GPS-1A GPS-2A 109C 238C	260A 262A 803A 805C	108A 164A 179A 108C 164C	387AT 388AT 389F 390AT 391AT	346F 347F 348F 349F 351CT 345AT 340AT 368F 338F 337F 336F 406F 555F	208C 376C 378C 379C 380C 138C 382C